# TRS-80®

# DMP-2100
# OPERATION MANUAL
## Catalog Number 26-1256

Radio Shack

TRS-80

COMPUTER PRODUCTS

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# Contents

# Introduction

Congratulations for selecting this Radio Shack computer product!

The DMP-2100 is a high-density, dot-matrix printer which can perform a variety of different printing operations.

For instance, it can print:

● Correspondence characters (monospaced and proportional spaced).
● Standard characters (monospaced).
● Condensed characters (monospaced).
● Graphic characters.

For maximum efficiency, the DMP-2100 operates in three modes:

● Data Processing Mode for fastest output of program listings or data.
● Word Processing Mode for letter-writing or the creation of any text documentation.
● Graphics Mode (regular and high-resolution) for drawing pictures, figures, or graphs.

For word or data processing, you'll find the DMP-2100's Correspondence or Proportional spaced characters (created on a variable $n \times 24$ dot-matrix) can produce letter-quality results.

If, however, you need a print-out that is produced faster, Standard characters (created on a $13 \times 24$ dot-matrix) are just the thing for you!

In the regular Graphics Mode, you can use graphic data with $3 \times 3$ dot-matrix to draw just about any type of graphic configuration you desire.

In addition, the DMP-2100 has the ability to print High-Resolution dot image graphics. This is accomplished by using High-Resolution Graphics Command and $2/15''$ line feed command which can be used in any three mode.

You can use two types of paper with the DMP-2100.

● Friction-fed ($4'' - 15''$ wide) computer fanfold forms with guide holes.
  The Printer can also print one original and up to three non-carbon copies.
● Friction-fed single-sheet typewriter paper for use as an ordinary typewriter.

Other software-controlled features include:

● Bidirectional minimum-distance access carriage motion.
● Full-or Half-Line Forward and Reverse (for printing above to below the "current" line) and 3/4 Line Feed.
● Underline capability.

and much more!

# 1/ Description of the DMP-2100

Carefully unpack the DMP-2100, being sure to locate the Ribbon Cassette. Keep the empty box and packing material just in case you ever need to transport the Printer.

Be sure to cut the white plastic band from the left side frame.
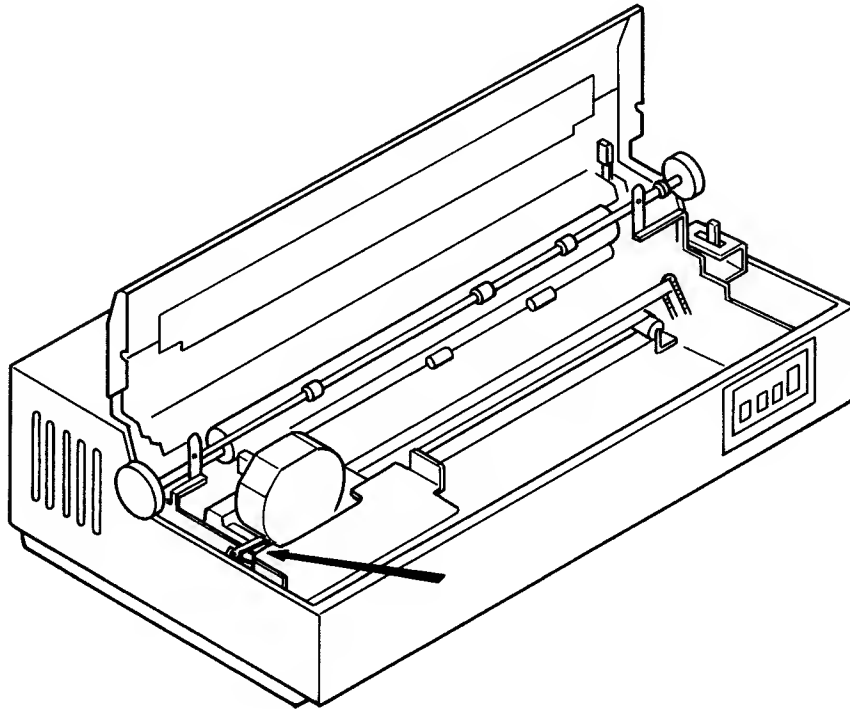


Figure 1. Cutting the White Plastic Band

It's important to become familiar with the DMP-2100 before you set it up and begin using it.
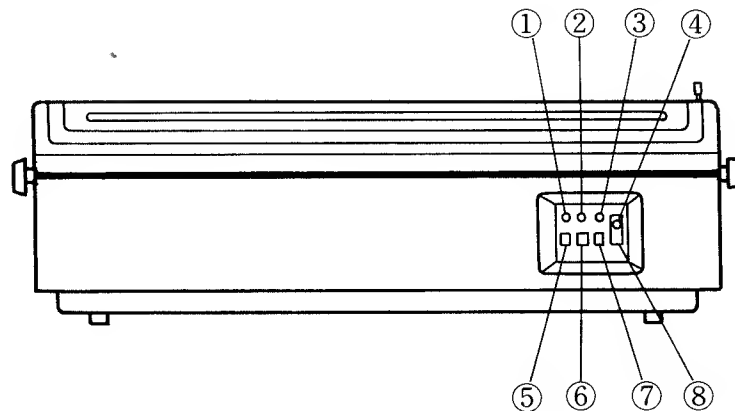


Figure 2. DMP-2100 (Front View)

① **POWER ON Indicator** (Red). This Indicator will illuminate when the DMP-2100 is properly connected and the Power ON/OFF Switch is set to ON.

② **ALERT Indicator** (Red).  This lamp will come on when there is a carriage fault, a paper jam, or some sort of electrical problem.

③ **PAPER END Indicator** (Red).  This Indicator will illuminate when the Printer is out of paper.

④ **ON-LINE Indicator** (Green).  When this Indicator is ON, the DMP-2100 is on-line and ready to print.

⑤ **TEST Switch.**  When this Switch is pressed and the Printer is off-line, test printing begins.

⑥ **PAPER FEED Switch.**  When the Printer is off-line and this Switch is pressed, the following operations will be performed:
- 1/24″ paper advancement.
- Holding this switch down will cause continuous paper feed.

⑦ **RESTART Switch.**  When this Switch is pressed after inserting new paper (in an out-of-paper condition), printing can resume.
When this switch is pressed during a carriage over-run alert condition, the Printer releases the alert condition and restores the Print Head to the home position.  (When carriage over-run occurs, the Printer frees the carriage.)  In this case, the data in the print buffer will be lost.  When the paper jam occurs during Single Sheet Feeder (optional/extra) operation, and then this switch is pressed after removing the paper, the printer releases the paper jam alert condition.  In this case, data will not be lost except "Insert New Paper" command.
The Self-Test printing ends when you press this switch.

⑧ **ON/OFF LINE Switch.**  When this switch is pressed when the Printer is off-line condition, the Printer goes on-line and is able to receive the data from the Computer.  During the following conditions, this operation is ignored:
- During an Alert Condition.
- When the Printer Top Cover is open.
- When the PAPER END lamp is blinking.

When this switch is pressed during an on-line condition, the printer goes off-line and stops printing at the end of line.

When the Printer stops because it is out of paper, the PAPER END lamp will blink and the Printer automatically goes off-line.  To continue printing, insert more paper, press RESTART, and then press ON/OFF LINE.  The DMP-2100 will go back on-line and continue printing without loss of data in the print buffer.

Model II users:  If a BASIC program stops execution because of a Printer error, typing: CONT **ENTER** will cause printing to resume.  However, the entire contents of the print buffer will be printed starting with the current Print Head position.
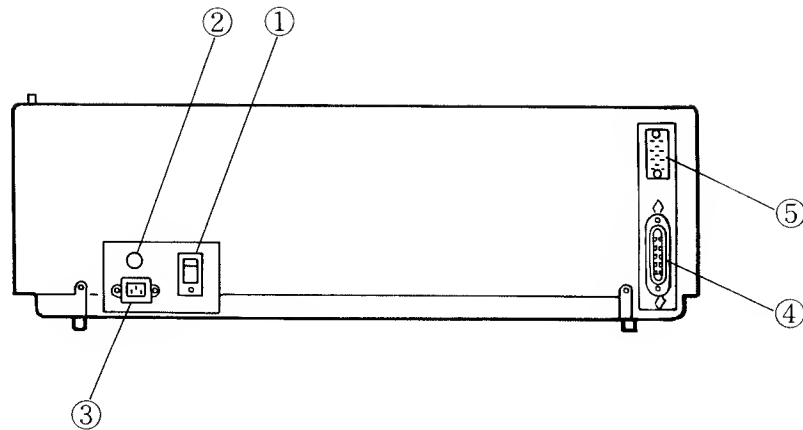
Figure 3.  DMP-2100 (Rear View)

① **Power ON/OFF Switch.**  Press the white dot to turn the power ON.  Press the Switch the other way to turn power OFF.  Note that turning the power OFF and ON during operation may cause loss of the current program.

② **Fuse Holder.**

③ **AC Power Cord Jack.**

④ **Parallel Interface Connector.**  If your TRS-80 has parallel interface capabilities, connect the cable here.  See **Setting-Up the DMP-2100** for the right cable for your TRS-80.

⑤ **Single Sheet Feeder** (optional/extra) **Connector.**
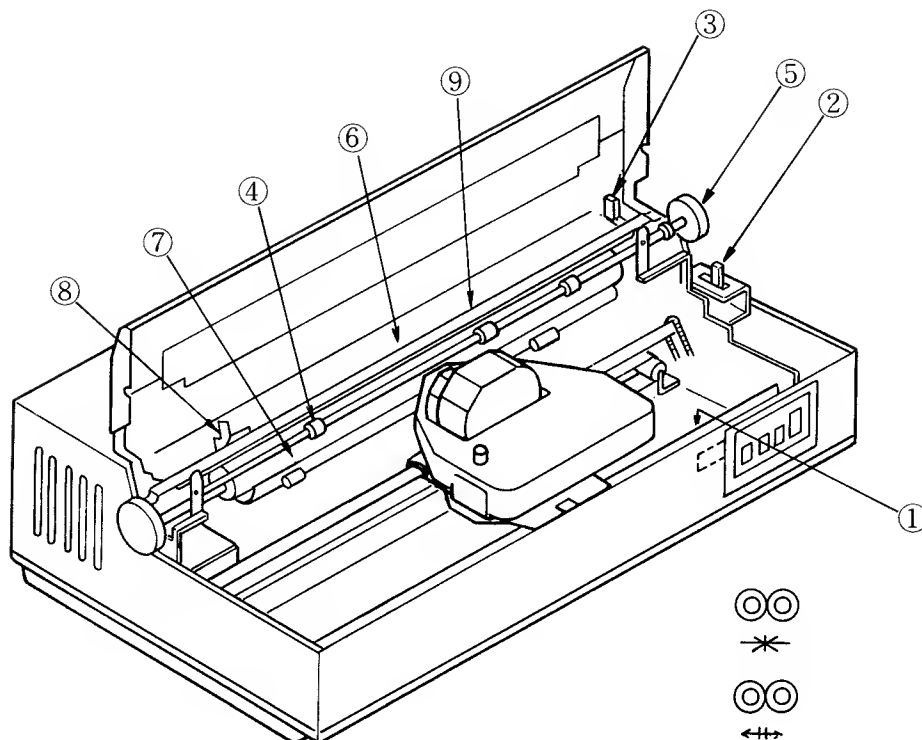
Figure 4. DMP-2100 (Inside View)

① **Function Selection (DIP) Switch.** This switch selects the character style/pitch and some of DMP-2100 features.

② **Copy Control Lever.** Set this lever at the notches of the scale according to the number of copies you're printing.

③ **Platen Pressure Lever.** If you are "friction feeding" paper, set this Lever away from you (and pressure will be ON). If you are "tractor feeding" paper, set this Lever towards you (and pressure will be OFF).

④ **Paper Bail.** For optimum print quality, keep the Bail down on the paper.

⑤ **Platen Knob.** Push and Turn this Knob to manually advance the paper.

⑥ **Paper Insertion Opening.** Be sure the paper enters the DMP-2100 here.

⑦ **Platen.**

⑧ **Paper Position Guide.**

⑨ **Paper Rest.**

# 2/ Setting Up the DMP-2100

This section will show you how to set up the DMP-2100 so you can begin using it as quickly as possible. This includes:

- Installing the Tractor Feed.
- Loading paper.
- Replacing a ribbon.
- Connecting the DMP-2100 to a TRS-80.

and more!

The following Start-Up Checklist is a summary of how to set up your Printer. You should follow this procedure every time you start-up the Printer —— not just first time.

☑ Find a good spot for your Printer. Be sure to consider:

- The Printer should be placed on a sturdy work surface.

- The length of the printer cable will determine how far from the TRS-80 you can place the Printer.

- Paper takes up space. Be sure to leave enough room for smooth paper flow if you're using the Tractor Feed.

- Don't place the Printer near noise generators such as refrigerators and industrial equipment.

☑ Be sure the POWER Switch (at right rear of Printer) is OFF.

☑ Open the Top Cover and remove the packing materials.

☑ Install continuous form fanfold paper or single-sheet paper.

☑ Check the Ribbon Cassette. If it has not been installed, see **Ribbon Installation/Replacement.**

☑ Set Function Selection (DIP) Switches (inside of Printer).

☑ Connect the AC power plug to a 3-wire, 120 volt, 60 Hz grounded AC outlet (220/240V, 50 Hz where the unit is so marked).

☑ Check that the Printer is ready by running the Self-Test.

☑ Connect the interface cable from the TRS-80 to the printer interface connector.

☑ Turn the Power ON and check that the Power Indicator (on the Front Panel) is illuminated.

## How Does the DMP-2100 Handle Paper?

The DMP-2100 provides both tractor feed for continuous forms and friction feed for single-sheet printing. The Tractor Feed Kit (optional/extra Radio Shack Catalog No. 26-1441) provides the tractor feed capabilities.

# Paper Loading

**Warning!** When loading paper (single-sheet or fanfold), be sure the paper correctly enters the Paper Insertion Opening.

If the paper is correctly loaded, it should enter between the body of the Printer and the Paper Rest. Once the paper is loaded and power is ON, check the PAPER END Indicator. If the lamp is illuminated, press the RESTART Switch. If the lamp remains on, the paper is probably loaded incorrectly.

If the lamp is not illuminated after the paper is loaded, you may begin printing (if the power is ON).

## Single-Sheet Paper Loading

For single-sheet paper operation, first remove the Tractor Feed if it is attached to the Printer.

1. Be sure the Power Switch is OFF.

2. Adjust the Copy Control Lever according to the number of copies.

3. Move the Platen Pressure Lever back towards the rear of the Printer.

4. Pull the Paper Bail forward (towards the front of the Printer).

5. Insert the paper into the Paper Insertion Opening. Use the Platen Knob to pull the paper around until it appears between the Platen and the Paper Bail.

6. Move the Platen Pressure Lever forward to align the paper. Move the Platen Pressure Lever back again.

7. Push the Paper Bail to Platen side.

    **Warning!** The Copy Control Lever must always be set according to the number of copies; otherwise damage to the Print Head may result.
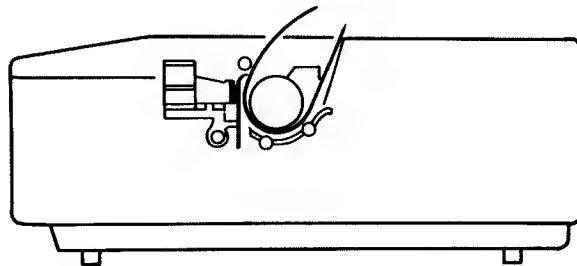
Figure 5. Single-Sheet Paper Feeding

**Hints and Tips On Single-Sheet Paper Loading...**

● With the paper properly installed, printing will continue until the paper is fed 8 lines (approximately 1″) after the paper passes the Paper Empty Sensor. The Printer will then go off-line. Insert another piece of paper and turn the Paper Feed Knob (or press the Paper Feed Switch) to advance the paper. When the paper is in place, press the RESTART Switch and the ON/OFF LINE Switch, then the DMP-2100 will continue printing from where it left off.

● Remember to set the Platen Pressure Lever to the rear of the Printer while using single-sheet paper.

## Fanfold Paper Loading

DMP-2100 will accept standard fanfold paper that is from 4″ to 15″ wide. The paper may contain one original and up to three copies.

Before using fanfold paper, however, the Tractor Feed should be installed. See your Tractor Feed unit operation manual for more details.

To load fanfold paper into the DMP-2100:

1. Set the Power ON/OFF Switch to OFF.

2. Adjust the Copy Control Lever according to the number of copies.

3. Gently move the Platen Pressure Lever toward the front of the Printer and move the paper position guide toward the left.

4. Rotate the Tractor Feeder to back side and open the lower Paper Clamps. Close the Clamps to secure the paper.

5. Rotate the Tractor Feed unit to the original position. Insert the paper into the Paper Insertion Opening. Use the Platen Knob to pull the paper around until it appears between the Platen and the Print Head.

6. Open the upper Paper Clamps of the Tractor Feed unit.

7. Close the Clamps to secure the paper.

8. Tighten the paper by rotating the Paper Tension Dial on the right side.

   **Warning!** The Copy Control Lever must always be set according to the number of copies; otherwise damage to the Print Head may result.

9. Replace the Top Cover.
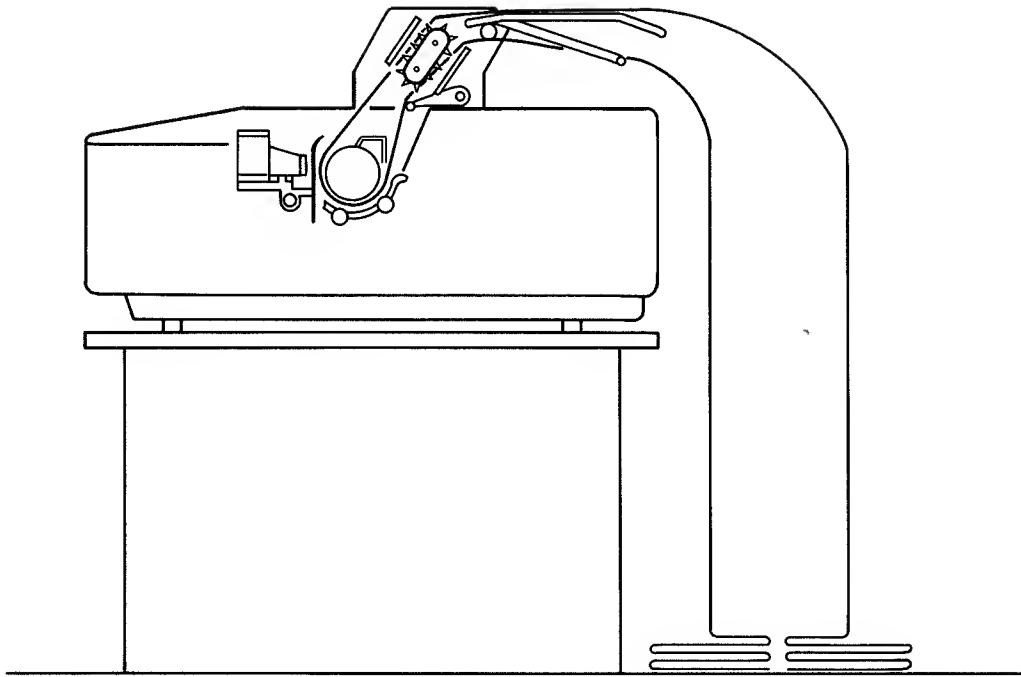
Figure 6. Fanfold Paper Feed

Paper Tension Dial
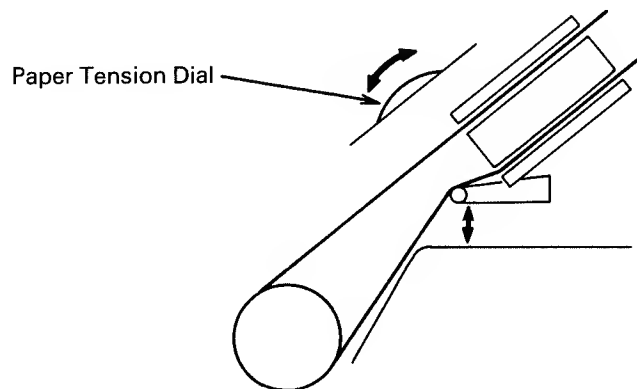
Figure 7

**Hints and Tips On Fanfold Paper Loading...**

● Whenever pin feed paper is used, the Platen Pressure Lever must be toward the front of the Printer. For friction feed paper, set the Lever to the rear of the Printer to apply pressure to the paper.

● Be sure that the paper is positioned so that it can travel through the Printer without binding.

● Do not let paper pile up on top of unprinted paper or printed paper may be pulled back into the Paper Insertion Opening. This could jam the paper feed or damage the Printer.

# Ribbon Installation/Replacement

If the Ribbon Cassette is already installed, simply check to see that it is properly threaded between the Head Mask and Print Head.

If the Ribbon Cassette is not installed, or if it must be replaced due to excessive wear, faint printing, etc., follow this procedure:

1.  Set the Power switch to OFF. (Note: When you turn the power OFF, any information stored in the Printer's buffer will automatically be lost.)

2.  Open the Top Cover.

3.  Gently grasp the Ribbon Cassette at the corners nearest the paper and remove it by lifting either side.

4.  Upwrap the new Cassette and remove the packing foam.

    Before inserting the new Cassette, tighten the Ribbon by turning the Knob in the direction indicated by the arrow.

5.  Insert the ribbon at the end of Ribbon Cassette between the Head Mask and the Print Head. Then, place the Ribbon Cassette on the Cassette Holder, and press down. The Ribbon Cassette is set.
    Do not force the Cassette into place! If the Cassette is not properly fitted, the Cassette knob will not match up with the shaft from the Carriage. Do not force the Cassette down but fit it in gradually while turning the Cassette knob in the indicated direction.

6.  Once the new Cassette is installed, gently slide the ribbon in between the Head Mask and the Print Head. Tighten the ribbon by turning the Cassette knob in the indicated direction.

7.  Move the Carriage back and forth manually to check that the ribbon advances properly. If the ribbon has not been properly fitted between the Head Mask and Print Head, the Ribbon feed will not operate smoothly. (See Figure 8.)

8.  Close the Top Cover.

    If it is hard to insert the ribbon between the Head and the Head Mask, move the Copy Control Lever to position # 4, and insert the ribbon. After setting the ribbon Cassette, move the Copy Control Lever to the correct position.
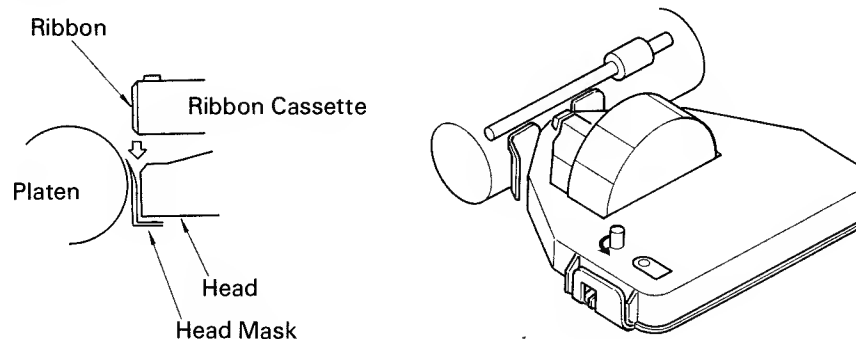
Figure 8. Installed Ribbon Cassette

# Setting Function Selection (DIP) Switches

There are 8 switches inside of the Printer. These Switches allow you to customize some of the DMP-2100 features for your own applications.

For instance, by setting the appropriate Switches before turning the DMP-2100's power ON, you can select Word Processing Mode or Data Processing Mode.

When you receive the DMP-2100, all Switches should be set to OFF.

**Remember!** The Printer power must be OFF before you change any of the Switches. On power-up, these become the default settings.
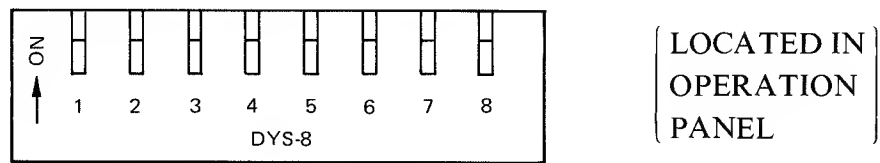


FUNCTION SELECTION SWITCH

| | OFF | | | ON |
|---|---|---|---|---|
| 8 | | | | |
| 7 | ASCII CHARACTER | | | TANDY CHARACTER |
| 6 | Carriage Return with Line Feed | | | Carriage Return only |
| 5 | Line Feed only | | | Line Feed with Carriage Return |
| 4 | DP MODE | | | WP MODE |
| 3 | 2 | 1 | | CHARACTER |
| | OFF | OFF | OFF | STANDARD-10 |
| | OFF | OFF | ON | STANDARD-12 |
| | OFF | ON | OFF | CONDENSED-16.7 |
| | OFF | ON | ON | STANDARD-10 |
| | ON | OFF | OFF | CORRESPONDENCE-10 |
| | ON | OFF | ON | CORRESPONDENCE-12 |
| | ON | ON | OFF | STANDARD-10 |
| | ON | ON | ON | PROPORTIONAL |

Figure 9. Function Selection (DIP) Switches

# Connecting the DMP-2100 to a Power Source

Before plugging the power cord into an AC power outlet, check the following:

☑ Is the Printer Power ON/OFF Switch set to OFF?

☑ Have you cut the white plastic band from the left side frame?

☑ Don't connect the Printer to the Computer yet.

Connect the AC power plug to a 3-wire, 120 volt, 60 Hz grounded AC outlet (220/240V, 50 Hz where the unit is so marked) or an approved power strip such as the Radio Shack **Plug-In Power Strip** (61-2619) or the **Automatic Power Controller**, SW-301 (26-1429).

## Self-Test

The DMP-2100 has a "built-in" self-test feature which lets you check printing quality and general printer operation before you connect the Printer to a TRS-80. This is a good time to check that the Print Head is adjusted properly (printing is neither too faint nor smudging occurs) and if the paper is feeding properly.

The Self-Test includes the various printer font styles, print widths and intensities, underline, graphics characters, and even a dot graphics sample. Before running Self-Test, be sure to load wide paper into the Printer.

To run the Self-test:

1. Plug the Printer into an AC power outlet.

2. Set the Power ON/OFF Switch to ON.

3. Set the ON/OFF LINE Switch to OFF-LINE.

4. Press the TEST Switch.

   The Printer will begin printing almost all the characters that it's capable of printing.

5. The Self-Test printing will stop when the:

   ● Self-Test has been completed. (58 lines)

   ● Printer cover has been opened.

   ● RESTART Switch has been pressed.

   ● Out of paper condition has been detected.

# Connecting the DMP-2100 to the TRS-80

Before making any connections between the Printer and TRS-80, be sure all units are off!

You must also be sure to have the correct cable your TRS-80 if the DMP-2100 is to operate properly. Table 4 describes the printer cables Radio Shack provides; Table 5 provides quick instructions for printer connection locations.

| TRS-80 to DMP-2100 Cables | |
| --- | --- |
| TRS-80 | Cable Number |
| Model I (Keyboard only) | 26-1411 |
| Model I (Exp. Interface) | 26-1401 |
| Model II/16/DT-1 | 26-4401 |
| Model III | 26-1401 |

Table 4

| TRS-80 Connection Points | |
| --- | --- |
| TRS-80 | Connector |
| Model I (Keyboard only) | Rear of Keyboard |
| Model I (Exp. Interface) | Left side of E.I. |
| Model II/16 | Rear Panel of Computer |
| Model III/DT-1 | Underneath panel |

Table 5

1.  Attach the molded male end of the cable to the connector at the left rear of the Printer.

    Do not force the plug. If it doesn't fit one way, turn it over and try again.

2.  Connect the other end of the cable to the Printer Jack of your Computer. See your TRS-80 owner's manual for specific instructions.


## Power-Up Sequence

The specific power-up sequence will depend upon your Computer. We suggest you consult your TRS-80 owner's manual for details on powering up your TRS-80 with peripheral devices (such as printers).

In any event, the Power Lamp will remain lit while the Printer is ON.

It is essential that the Printer remain ON when connected to the Computer. If you turn the power ON or OFF, or a Printer is connected but not turned on, erratic operation of the entire system may occur.

# Printing Limits (Duty Cycle)

The DMP-2100 does have its limits when it is in heavy and/or continuous printing. Depending upon the type of printing to be performed, those limits vary.

The following tables show guidelines of such printing limits:

| DMP-2100 Pinting Limits | | | | |
|---|---|---|---|---|
| (1) Characters & Regular, Block Graphics | | | | |
| Type of Printing | | % | | Number of Pages |
| ● Characters (standard-10) | at | 100% | for | continuous |
| ● Low Resolution Graphics | at | 100% | for | 1/6 |
| | at | 50% | for | 3 |
| | at | 18% | for | continuous |
| ● Block Graphics | at | 100% | for | 3 |
| | at | 40% | for | continuous |

**Note #1** These figures are based on a 132-columns printing width. 100% printing means that all possible print positions are to be printed; 50% printing means that every other column is printed.

| (2) High Resolution Graphics | | | | |
|---|---|---|---|---|
| ● High Resolution Graphics | at | 50% | for | 1/6 |
| | at | 25% | for | 3 |
| | at | 10% | for | continuous |

**Note #2** When printing High resolution graphic "points", pay attention to the following restriction.

Do not use any vertically adjacent points at the same instant to draw a line; use them alternately.
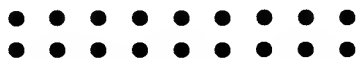


| NG | OK |

# 3/ Using the DMP-2100 (General Printer Operation)

The DMP-2100 is designed for three distinct applications:

- Data Processing Mode
- Word Processing Mode
- Graphics Mode (regular and High-Resolution)

The Printer has three different responses to software codes from the TRS-80 — one for each application. The three response patterns, or modes, have many similarities, but each has its own unique features.

Data and Word Processing modes are used for printing characters. The only difference between these two modes is the way they handle Line Feed commands (commands that decide which direction and how far the paper is fed).

- In the Word Processing mode, each Line Feed command causes immediate paper advancement. Word Processing programs (such as SCRIPSIT) can use immediate line feeds for superscripts, subscripts, and the like.

- In the Data Processing mode, Line Feed commands (except 1/120″ and 2/15″ line feed command) do not cause immediate printing. Instead, they are stored in the Printer's memory along with the other data. When the current line is printed, the Line Feed commands stroed in memory determine the direction and pitch of the paper feed.

Both Data and Word Processing can print in different Print Font Styles and in different Pitches (character spacing). One font style is the Proportional character set and the other is Monospaced character set.

- Proportionally spaced characters have variable widths: an M takes up more space than an I. Proportional characters are used to create professional looking documents.

- Monospaced characters are so named because each character takes up the same width. This uniformity makes it preferable for tables and charts that require vertical aiignment.

The font styles are determined by the dot-matrix pattern. Monospaced characters use a 18 × 24 and 15 × 24 matrix while Proportional spaced characters use $n$ × 24.

The Print Pitch (character spacing) is determined by the space the DMP-2100 puts between each printed character and also by the Font Style. Consequently, you must think of Pitch in terms of the number of characters printed per inch — 10CPI, 12CPI, and 16.7CPI for Normal printing and 5CPI, 6CPI, and 8.3CPI for Elongated printing.

Both Graphics Modes can be used to create custom letterheads, designs, special type fonts, etc.

However, with Graphics operation, many control codes (which can be used with Data and Word Processing) cannot be used. The DMP-2100 doesn't return an error when you send such a code — it simply ignores the code. This includes codes that change line feed pitch and direction.

In Graphics Mode, only one line feed (7/60″) is availabele to insure full coverage of the paper (1/120″ and 2/15″ line feed can be used if you want).

## Control Codes

Before investigation of the various print modes, consider how the TRS-80 communicates with the Printer.

All information is sent to the Printer as numbers between 0 and 255 decimal (00 ~ FF for you Hexadecimal fans). The Printer interprets numbers according to the American Standard Code for Information Interchange, commonly referred to as the ASCII code. (See **Appendix B** for a list of ASCII codes.) Most numbers (or codes) are printed as letters, numbers, or symbols. However, the numbers 0 ~ 31, as well as some special sequences of code numbers, are used to "control" various functions of the Printer. These "Control Codes" allow you to change character sets, select print modes, underline, superscript, subscript, etc.

The Control Codes have different meanings depending on the current print mode. If a Code is not recognized by the Printer, it is printed as X. The next few sections demonstrate how some of the Control Codes activate various Printer functions. Read these sections carefully.

# Sending Control Codes from BASIC

Some Printer features are activated by a single code, but many functions require a sequence of two or more codes. Most multiple code sequences begin with decimal 27 (referred to as the "ESCape" code). The ESC code notifies the Printer that a special sequence is on its way. The next code(s) sent determine which Printer feature is selected. In BASIC, use CHR$ (   ) to send these codes to the Printer.

For instance, set up the DMP-2100 as described earlier and enter BASIC in the normal way.

Then type the following program:

```
10  REM
20  LPRINT  "DATA";CHR$(27);CHR$(28);"PROCESSING"
30  LPRINT  "MODE"
```

and RUN it.

Roll the paper forward and look at the results. The word MODE printed over part of the word DATA. Why? The codes CHR$(27) and CHR$(28) are the guilty parties. Take a quick look at **Appendix A**. This chart shows the various code sequences understood by the DMP-2100. The Control Code sequence CHR$(27) ; CHR$(28) means "change the forward line feed to half its normal distance".

## Data Processing Mode

How can you tell which mode the DMP-2100 uses when it's first turned on? A little reflection on the above program tells you all you need to know.

Line Feed commands are executed immediately in Word Processing (WP) Mode, but not in Data Processing (DP) Mode. The (27 28) sequence didn't cause a Half-Forward Line Feed until after the first line was printed. Thus, the Printer must be in DP Mode. And, in case you missed it, this new Line Feed stays in effect until further notice (another characteristic of DP Mode).

Type: LLIST **ENTER**

Sure enough. You still have that short Line Feed.

## Word Processing Mode

If the same program were executed in WP Mode, the Line Feed would have occured immediately after the word DATA. Go into WP Mode and try it. To enter WP Mode, change line 10 to:

```
10 LPRINT CHR$(20):REM CHR$(20) SELECTS WP MODE
```

and RUN the program.

Just as you suspected, the Line Feed is immediateiy executed.

Note that in WP Mode, the new Line Feed is only temporary. Type:LLIST **ENTER** to prove that the Half-Forward Line Feed occurs only once, then returns to normal.

## Graphics Mode

Graphics Mode is very different from the other two printer modes. For one thing Graphics Mode accepts only three Line Feed codes — LF code (10 Dec), 1/120″ line feed (27,49 Dec) and 2/15″ line feed (27,71 Dec). Line Feed code (10 Dec) is fixed at 7/60″. Furthermore, only a few of the WP and DP features are available in Graphics Mode. Normal letters and symbols, for example, are ignored by Printer when it is in Graphics Mode. Instead, numeric data from 128 to 255 is translated into dot patterns for the Print Head. This lets you produce graphics print-outs of charts, logos, etc.

For a quick look at this Mode in action, change our test program to:

```
10 LPRINT CHR$(18)
20 FOR I=128 TO 255
30 LPRINT CHR$(I);
40 NEXT
```

and RUN the program.

CHR$(18) puts the DMP-2100 into Graphics Mode.  The numbers 128 through 255 are interpreted as dot patterns.

Type: LPRINT CHR$(30) **ENTER** to return the Printer to WP Mode.  Try LLISTing the program to be sure you're not stuck in Graphics land.

# Selecting a Print Mode.

Table 6 summarizes the Control Codes required to move from one mode to another.

| If you're in: | and want to change to: | Send a CHR$( ): |
|---|---|---|
| DP | WP | 20 |
| | Graphics (regular) | 18 |
| | Graphics (High-Res) | 27 73 |
| WP | DP | 19 |
| | Graphics (regular) | 18 |
| | Graphics (High-Res) | 27 73 |
| Graphics | DP | 30* |
| | WP | 30* |
| | *Returns to last Mode (WP or DP) used. | |

Table 6

## Hints and Tips About Print Modes...

**Data Processing Mode**

● All commands which decide Line Feed pitch and direction of movement (except 1/120″ and 2/15″ line feed) are stored in the Printer's memory.  They are not executed until a LF code (10 Dec.) is received.  Then, the paper advances according to the pitch and direction codes stored in the Printer's memory.
● Line Feed commands stay in effect until replaced by a new command.
● All printable characters can be printed in this mode.

**Word Processing Mode**

● Line Feed codes that determine pitch or direction are executed immediately.

● Line Feed pitch and direction changes affect only the current print line.

● All printable characters can be printed in this mode.


**Graphics Mode**

● This mode is very different from the other two modes. In Graphics Mode, only three Line Feed code (10 Dec.), 1/120″ line feed (27,49 Dec) and 2/15″ line feed (27,71 Dec) are acceptable. These Line Feed codes cause the paper to move 7/60″ forward, 1/120″ forward, and 2/15″ forward.

● Decimal numbers 128 ~ 255 sent via CHR$ in BASIC are interpreted as pin firing patterns for the Print Head.

● Only a few code sequences are recognized in Graphics Mode.

# 4/ Print Font Styles and Character Widths

The DMP-2100 has four distinct print (character) font styles:

● Standard and Condensed

● Correspondence

● Proportional

● Graphic Characters

Each font style is created with a unique dot pattern laid out in a grid or matrix.

The character styles differ in the size of the matrix and the way individual characters are created within the matrix.

| Character Width and Densities | | |
|---|---|---|
| Font Style | Matrix Size | Pitch |
| Standard | $18 \times 24$ | Normal 10 CPI/Elongated 5 CPI |
|  | $15 \times 24$ | Normal 12 CPI/Elongated 6 CPI |
| Condensed | $18 \times 24$ | Normal 16.7 CPI/Elongated 8.3 CPI |
| Correspondence | $36 \times 24$ | Normal 10 CPI/Elongated 5 CPI |
|  | $30 \times 24$ | Normal 12 CPI/Elongated 6 CPI |
| Proportional | $n \times 24$ | Variable width (can be Elongated) |
| Graphics | $18 \times 16$ | Normal 10 CPI/Elongated 5 CPI |

Table 7

Table 7 suggests that The DMP-2100 has three basic dot pitches.

● Standard (10, 12 CPI)

● Condensed (16.7 CPI)

● Correspondence (10, 12 CPI, Proportional, Graphics [10 CPI])

If a font style is changed in a line without changing the dot pitch, the line is printed continuously without pausing. For example, the DMP-2100 will not pause while changing from Proportional printing to Correspondence 10 CPI print since both use the same dot density. On the other hand, if the density of the new style character is different from the preceding one, the Printer will print the current buffer contents, then resume printing in the new character style. In case of the junction at condensed character and the other characters, some dot space will be left because of the changing of the dot density. For example, this will happen if you change from Standard to Condensed.

# Selecting Font Styles

Character font styles may be selected by the Function Selection Switch setting before power-up (via hardware) or by Control Codes from the TRS-80 (via software) during operation.

The Function Selection Switch determines the character style and pitch selected on power-up; after that, you control the styles and pitches via Control Codes.

Font styles stay in effect until another font style is selected. Even entering Graphics Mode does not change the font. The DMP-2100 returns to the last active font on leaving Graphics Mode.

Table 8 is a summary of the Character Style change commands:

| Set Function Selection Switch To: * | | | Or Send a CHR$( ): | | If You Want: |
|---|---|---|---|---|---|
| 1 | 2 | 3 | | | |
| OFF | OFF | OFF | | | |
| ON | ON | OFF | 29 | 19 | Standard-10 |
| OFF | ON | ON | | | |
| ON | OFF | OFF | 27 | 23 | Standard-12 |
| OFF | ON | OFF | 27 | 20 | Condensed-16.7 |
| OFF | OFF | ON | 27 | 18 | Correspondence-10 |
| ON | OFF | ON | 27 | 29 | Correspondence-12 |
| ON | ON | ON | 27 | 17 | Proportional |
| | | | 27 | 14 | Start Elongation |
| | | | 27 | 15 | End Elongation |
| | | | 27 | 31 | Start Bold |
| | | | 27 | 32 | End Bold |

*Function Selection Switch must be set before power-up.

Table 8

## Standard and Condensed Character Font Styles

The Standard and Condensed character sets are composed of 13 x 24 dot matrix and the character pitch is determined by the space the DMP-2100 put between each character or by the dot pitch.

Three character widths are accomplished by this font:

● Standard-10 Character Per Inch (CPI)      (18 dots × 1/180″)

● Standard-12 CPI      (15 dots × 1/180″).

● Condensed-16.7 CPI      (18 dots × 1/300″)

Each of these widths can be elongated (double-width) which gives half as many characters per inch and a total of 6 different print widths.

You can get a better feel for the different available print widths by printing a few sample lines. Type in this program:

```
NEW  ENTER
110 F$ = "STANDARD AND CONDENSED "
120 N = 19 : W$ = "10 CPI" : GOSUB 240
130 N = 23 : W$ = "12 CPI" : GOSUB 240
140 N = 20 : W$ = "16.7 CPI" : GOSUB 240
230 LPRINT CHR$(27);CHR$(19) : STOP
240 LPRINT CHR$(27);CHR$(N) F$ "CHARACTERS " ; W$
250 RETURN
```

and RUN it.

The subroutine in line 240 sends the required Control Codes to the DMP-2100. Line 230 returns to Normal character width and stops program execution.

## Correspondence Font Style

The second character set is a 30 × 24 dot matrix character set for Correspondence 10 and 12 CPI. The characters have the same total width as Standard-10 or 12 characters, but they are printed with the 1/360″ dot density (36 dots wide fits in the same space as 18 dots wide). Correspondence print can be elongated to 5 and 6 CPI.

● Correspndence-10 CPI          (36 dots × 1/360″)

● Correspndence-12 CPI          (30 dots × 1/360″)

Correspondence characters appear to be the same as Standard characters in Normal width, but they are an entirely unique character style. Add these lines to the program, then compare the two styles.

```
150 F$="CORRESPONDENCE ":N=18:W$="10 CPI":GOSUB 240
160 N=29:W$="12 CPI":GOSUB 240
```

and RUN the program.

The difference between each character is quite different. This is a good style to use with word processing programs that do not support proportional characters.

## Proportional Spacing Font Style

The third character set is the Proportional spaced character set. This character font style is also different from other two fonts, and the character matrix width varies from character to character. The widths vary from 16 dots to 46 dots (with 1/360″ dot pitch).
Add this line to the program, then compare with the other styles.

```
170 F$="PROPORTIONAL ":N=17:W$="VARIABLE PITCH":GOSUB 240
```

and RUN the program.

Proportional characters add a quality look to word processing documents by eliminating wide gaps between characters. These characters can also be elongated to double their normal width.

## Graphic Characters

The fourth character set is a 18 × 16 dot matrix character set used for Block Graphic printing.
The characters can be Normal 10 CPI width.
This set is not fully compatible with the screen graphics of any of the TRS-80 computers; rather it is a unique character set.

A 18 × 16 dot matrix character set is available in all character conditions and is printed always 10 (Normal) or 5 (Elongated) CPI.

To see how the various character widths can not affect the graphics characters, add;

```
190 N = 19 : W$ = "10 CPI" : F$ = "GRAPHIC " : LPRINT
200 GOSUB 240 : GOSUB 260
210 N = 23 : W$ = "12 CPI" : GOSUB 240 : GOSUB 260
220 N = 20 : W$ = "16.7 CPI" : GOSUB 240 : GOSUB 260
260 FOR I = 224 TO 254 : LPRINT CHR$(I); : NEXT I
270 LPRINT : RETURN
```

and RUN the program.

Since the normal line-to-line spacing is 1/6" or 30 dots high and the Graphic Characters are 15 dots high, we can create continuous vertical graphics by using the Half Forward Line Feed (CHR$(27); CHR$(28)). Add these lines to the program:

```
10 LPRINT CHR$(27) ;CHR$(28) ;
20 FOR R=1 TO 3
30 FOR C=1 TO 7
40 READ N:LPRINT CHR$(N);
50 NEXT C:LPRINT
60 NEXT R:LPRINT CHR$(27) ;CHR$(54);
70 DATA 241 ,243 ,241 ,224 ,241 ,243 ,241
80 DATA 224 ,244 ,241 ,241 ,241 ,249 ,224
90 DATA 241 ,248 ,241 ,224 ,241 ,248 ,241
```

and RUN.

When you're printed out the results, delete lines 10 through 90.


## Right Justification

Proportional Characters are designed to be used with word processing programs. They don't carry around all the wasted space between words that monospaced print styles do. As a result, you can sneak in little slivers of space between characters to line up the right margin of text on a page without destroying the nice character spacing. This process, called "Right Justification", is ususally handled by word processing software. The DMP-2100 provides codes to allow you to insert spaces between characters ranging from 1 dot 9 dots wide.

You can demonstrate the way these codes work by modifying the current program. Then you add the following two lines, the DMP-2100 will print two lines of Proportional Characters, then insert enough space to line up the right margins.

```
70 DATA"THE PROPOTIONAL CHARACTER SET OF THE"
80 DATA"DMP-2100 PRINTER CAN BE RIGHT JUSTIFIED"
```

The lines will be read in as a string of characters with the MID$ function. Enter:

```
10 LPRINT CHR$(27) ;CHR$(17);
20 FOR I=1 TO 2:READ A$
30 FOR J=1 TO LEN(A$)
40 LPRINT MID$(A$,J,1) ;
50 REM
60 NEXT J:LPRINT:NEXT I
90 LPRINT CHR$(27) ;CHR$(19):END
```

Now RUN the program.

To line up the right edge, insert a single blank dot column between the first 9 letters in the second print line.  Change:

```
50 IF I = 2 AND J < 10 THEN LPRINT CHR$(27);CHR$(1);
```

then RUN the program.

Table 9 may help when inserting spaces.

| Send CHR$( ): | To Insert This Much: |
|---|---|
| 27    01 | 1   Dot Space |
| 27    02 | 2   Dot Spaces |
| 27    03 | 3   Dot Spaces |
| 27    04 | 4   Dot Spaces |
| 27    05 | 5   Dot Spaces |
| 27    06 | 6   Dot Spaces |
| 27    07 | 7   Dot Spaces |
| 27    08 | 8   Dot Spaces |
| 27    09 | 9   Dot Spaces |

Table 9

The Dot Widths include space between characters.

If a micro-space command is used at the end of text (exceeding a line length), it generates a line-full condition.  Printing will start and micro-spacing command will begin at the start of next line.  If several kinds of micro-spacing commands in succession at the end of text are used, and if the row of micro-spacing commands cause a line-full condition, only the last micro-spacing command is set at the head of the next line.

Delete lines 10 through 90 of your sample program before going on.

# Wrap-Around

The DMP-2100 is a dot-addressable printer. Therefore line length is not determined by the number of characters, but by the number of dots per line. The numbers of addressable dot-per-line in Data Processing or Word Processing Mode are:

- Standard-10 = 2448

- Standard-12 = 2448

- Condensed-16.7 = 4080

- Correspondence-10 = 2448

- Correspondence-12 = 2448

- Proportional = 2448

If the length of text the Printer receives exceeds the limit of dots-per-line, a Line Feed is inserted and the last character is printed from the start of the next line. This is called "wrap-around".

If you print two or more different pitches on the same line, calculation of the line length can be somewhat complicated. Micro-dot spacing can be used to adjust for the different densities.

## Elongated Characters

Any of the character font styles can be elongated to twice their normal width.

| Elongated Printing | |
|---|---|
| Send CHR$( ): | To: |
| 27    14 | Start Elongation |
| 27    15 | End Elongation |

Table 10

The start (27 14) and end (27 15) elongated characters may be entered any number of times within a line and can be used in every mode.

You can easily elongate the characters in the current program. Change:

```
100 LPRINT CHR$(27) ;CHR$(14)
230 LPRINT CHR$(27) ;CHR$(19) ;CHR$(27) ;CHR$(15):STOP
```

and RUN the program.

## Bold Characters

Bold characters are printed by printing a character twice–the second time slightly off to the side.

| Bold Printing | |
|---|---|
| Send CHR$( ): | To: |
| 27    31 | Start Bold Printing |
| 27    32 | End Bold Printing |

Table 11

When a (27 31) code sequence is received, the DMP-2100 prints the current buffer contents, then resumes Bold character printing from next character received.

Bold characters can be added to the current program by changing lines:

```
100 LPRINT CHR$(27) ;CHR$(31)
230 LPRINT CHR$(27) ;CHR$(19) ;CHR$(27) ;CHR$(32)
```

and RUNning it.

## Mixing Bold and Elongated

Bold and Elongated characters can be active at the same time.

# 5/ General Control Codes

## Line Feed codes (LF)

When a LF code (ASCII 10) is received by the DMP-2100, all data in the Printer buffer is printed followed by a Line Feed. Unless you tell it otherwise, the DMP-2100 uses 1/6″ Forward Line Feed when advancing paper.

If Function Selection (DIP) Switch # 5 is ON (in the up position), a Carriage Return is also performed with the Line Feed, moving the printing position to the next print line. If Switch # 5 is OFF, the printing position stays in the current print column and moves down one line.

Other Line Feed codes control the pitch and direction of the Line Feed. In DP Mode, these codes may be stored in the buffer.
In WP Mode, they cause immediate printing.

Pitch and direction settings are sent to the DMP-2100 in a two code sequence. First, a Control Code 27 is sent (CHR$ (27)). This tells the DMP-2100 that a special code sequence will follow. The next number determines the specific pitch and direction. These Control Codes are listed in Table 12.

| Line Feed Contlrol Codes | |
|---|---|
| Send CHR$ (   ): | To: |
| 27    10 | Full Reverse Line Feed (1/6″) |
| 27    28 | Half Forward Line Feed (1/12″) |
| 27    30 | Half Reverse Line Feed (1/12″) |
| 27    54 (Ignored in WP mode) | Full Forward Line Feed (1/6″) |
| 27    56 | 3/4 Forward Line Feed (1/8″) |

Table 12

**Hints and Tips On Line Feed . . .**

● In Data Processing Mode, codes are stored in the Printer buffer. They are not activated until a LF code is sent. In the Word Processing Mode, these sequences cause the Printer to print the information in its buffer, then execute a Line Feed with the  specified pitch and direction.

● CHR$ (27); CHR$ (10) will not work from BASIC with the CHR$ function. The LF code (10) is intercepted by BASIC and sent to the pritner as 13.

● CHR$ (27); CHR$ (54) is ignored in Word Processing Mode since it duplicates the LF code.

● Line Feed pitch and direction codes have no effect in Graphics Mode. The Line Feed is set to 7/60″ forward.

- If Function Selection Switch #5 is ON, a Carriage Return follows each Line Feed except only the 1/20 (1/120″) Forward Line Feed.

**Note:** Restrictions for paper feeding

- None of the reverse feeding commands can feed the paper backward beyond the "Top-of-Form". In this case, these commands are ignored by the Printer.

- If you perform the following operations, a paper jam will occur:
  - Under the Single Sheet Feeder operation, and if you feed the paper backward more than 3 lines (half inch).
  - If you feed the paper backward near the bottom of the paper.

- When the out of paper condition has been detected within the form length, the Printer ignores the residual paper feeding commands (to the end of the form length) unless there are available printing characters. This allows the page control without form feed (FF) command.

# Special Line Feed Control Codes

There are two special Forward Line Feed codes that operate the same regardless of the current mode. They are:

| Special Line Feed Control Codes | |
|---|---|
| Send CHR$ (   ): | To: |
| 27   49 | 1/20 forward Line Feed (1/120″) |
| 27   71 | 12/15 Forward Line Feed (2/15″) |

Table 13

The codes initiate an immediate dump of the Printer buffer, followed by a Line Feed.

These special Line Feed Codes are useful for adjusting a print line or dot-matrix picture.

**Note:** 1/20 (1/120″) forward Line Feed code does not cause a Carriage Return regardless of the Function Selection Switch #5.

## Carriage Return (CR)

A CR (13) Code tells the Printer to print the current buffer contents, then perform a Carriage Return. If Function Selection (DIP) Switch # 6 is OFF, one line feed (the current active line feed) will be performed at the same time. If Switch # 6 is ON, a line feed is not activated and printing continues on the same line.

## Backspace (BS)

The DMP-2100 can be backspaced from one to 255 dot-columns with when you send it a two code sequence of which the first code is CHR$ (8). The second code is in the form of CHR$ (*n*) where *n* is a value from 1 to 255 and specifies how many dot-columns to backspace from the current printing position. For example:

```
LPRINT CHR$(8); CHR$(150)
```

would backspace the printing position 150 dot-columns from the current position.

In general, backspacing should be done in multiples of the current character size. That is, backspacing for the Standard-10 character set should be 18 dots per character (13 dots plus 5 for spacing between characters).
For instance, LPRINT CHR$(8); CHR$(36) would backspace two characters.

If *n* is 0, backspace will not occur. The repeat feature can be used to backspace more than 255 dot-spaces.

If *n* is greater than the current dot-position, printing starts at the beginning of the line. In Graphics Mode, the backspace code is ignored and *n* is treated as an independent character.
Backspace works in both Data and Word Processing Modes.

The backspace command is a print command. Receiving the backspace command causes the DMP-2100 to print all data in the buffer and to execute a backspace operation.

Type in this program:

```
10 LPRINT TAB(30) ;"D P 2 0";
20 LPRINT CHR$(8) ;CHR$(108) ;"M - 1 0"
```

and RUN it.

Go ahead and run it again. This time watch the action of the Print Head. The first string starts at Position 30. The trailing semicolon holds the position to the right of the zero. CHR$ (8); CHR$ (108) ; backspaces six Standard-10 character widths (18 dots each, remember?) to pace the M right between the D and P. You can imagine what would happen if the dot distance is miscaluculated? Ouch.

To backspace over elongated characters, simply double the number of dots. Let's try it. Change the program to:

```
10 LPRINT TAB(30) ;CHR$(27) ;CHR$(14) ;"D P 2 0";
20 LPRINT CHR$(8) ;CHR$(216) ;"M - 1 0"
30 LPRINT CHR$(27) ;CHR$(15)
```

and RUN the program.

CHR$ (27); CHR$ (14) and CHR$ (27); CHR$ (15) get the DMP-2100 in and out of Elongated Character width. Remember that you must compensate for the double-width character by doubling the 108 in line 20 to 216.

The widths of the available character font styles are shown in Table 14. The Proportional Character widths naturally vary from character to character.

| Character Set Width | | | | | | |
|---|---|---|---|---|---|---|
| Font Style | | Dots/ Character | To Backspace | | | |
| | | | 1 Character | | n Characters | |
| Standard-10 | 10 CPI | 18 | 08 | 18 | 08 | 18n |
| | 5 CPI | 36 | 08 | 36 | 08 | 36n |
| Standard-12 | 12 CPI | 15 | 08 | 15 | 08 | 15n |
| | 6 CPI | 30 | 08 | 30 | 08 | 30n |
| Condensed-16.7 | 16.7 CPI | 18 | 08 | 18 | 08 | 18n |
| | 8.3 CPI | 36 | 08 | 36 | 08 | 36n |
| Correspondence-10 | 10 CPI | 18 | 08 | 18 | 08 | 18n |
| | 5 CPI | 36 | 08 | 36 | 08 | 36n |
| Correspondence-12 | 12 CPI | 15 | 08 | 15 | 08 | 15n |
| | 6 CPI | 30 | 08 | 30 | 08 | 30n |

Table 14

The Dots/Character include dots beween characters.

## Setting Top-of-Form and Form Length

The Control Code CHR$ (27); CHR$ (52); CHR$ (n) is used to set the Form Length in all three print modes. After printing the current buffer contents, it resets the Line Feed count to zero and sets the current line as the Top-of-Form position. The line length per page is set to $n$ (x 1/6") to be used with the Form Feed code.

If $n = 0$, it is changed to 256. Whenever any Line Feed operation is activated, Line Feed pitch is counted up and compared with $n$ (x 1/6″).

On initial power-up, the DMP-2100 sets the Top-of-Form at the current paper position and the Form Length is set to 66 lines per page.
Be sure the paper is properly positioned before you turn on the Printer.

**Important Note #1:** In the follwing cases, the Top-of-Form position is set on the current paper position:

- The power has been turned on with paper on the platen.
- The DMP-2100 accepted the Set Form Length Code (CHR$ (27); CHR$ (52); CHR$ ($n$)) with paper on the platen.
- The RESTART Switch has been pressed after the new paper was set on the platen, while out-of paper condition.

**Important Note #2:** None of the Reverse Feed commands can feed the paper backward beyond the Top-of-Form position.

## Form Feed (FF)

When CHR$ (12) command is received, the print buffer contents are printed out completely, paper is advanced to the next Top-of-Form position and the Line Feed counter is reset to zero.

Under the Single Sheet Feeder (option) operation, this code causes the maximum 17″ paper ejection operation regardless of the Form Length.

However, there is one slight problem for those of you who communicate to the Printer through BASIC. Most BASICs keep track of the Top-of-Form internally and intercept the Form Feed code on its way to the Printer and send out instead a series of line feeds. Since the FF code never makes it to the Printer, the CHR$ (12) is not activated. Some BASICs can use the POKE or OUT statement to send a FF directly to the printer and bypass the intercepter.

**Important Note:** Do not use CHR$ (12) except for graphic applications. Radio Shack application programs have Top-of-Form "built-in". See your applications program user's guide for instructions on setting FORMS and the program will do the rest.

## Insert New Paper

The DMP-2100 has a Single Sheet Feeder option. Under the Single Sheet Feeder operation, the code sequence CHR$ (27); CHR$ (75) or CHR$ (27); CHR$ (76) causes the immediate paper insertion operation unless there is a paper on the platen.

These code sequences also designate the Bin from which the paper should be inserted after one of these code sequence is accepted.
This function will become available when the Single Sheet Feeder which has double bins.

**Note #1:** Insert New Paper code sequences cause the actual paper insertion, even if there is no data followed by this code sequence. In other word, if there is printing data in buffer, automatic paper insertion will be activated by the Printer.

**Note #2:** Under the Single Sheet Feeder operation, FF code causes the maximum 17″ paper ejection operation regardless of the Form Length.

# Ignored or Undefined Codes

Codes that are unusable or undefined in a given print mode are either ignored or printed with the symbol X which represents an invalid code.

There are several reasons a code may be unusable in a certain mode. Redundant codes that don't change the current printer status are usually ignored. For example, if the Printer is in DP Mode, sending a CHR$ (19) (used to enter DP Mode) is useless. And there are many ASCII control codes in the range 0 to 31 that the DMP-2100 simply doesn't recognize. ASCII 0, for example, is not used in any of the three print modes.

The following summarizes the undefined print codes:

| DMP-2100 Ignored Control Codes |
| --- |
| **All Modes:** <br> ● Out of range on repeat sequence. <br> ● Out of range POS sequence. <br> ● Redundant codes that don't change the current printer status. <br>    For example, if you send a CHR$ (14) when underline is already set. |
| **DP Mode:** 0, 1, 19, 30, 127, 255 <br> **WP Mode:** 0, 1, 20, 30, 127, 255, (27 54) <br> **Graphics Mode:** All code in the range 0-127 are ignored except <br>    (10), (12), (13), (27 14), (27 15), (27 16 $n1$ $n2$), (27 49), (27 52 $n$), (27 71), (27 73 <br>    $n1$ $n2$ ....), (27 75), (27 76), (28 $n1$ $n2$), (30). <br> Unprintable repeat sequence data $n2$ is also ignored. |
| **Codes printed as** X <br> **DP and WP:** <br> ● All codes from 0 – 31 and 128 – 159 except the active function code or the above ignored codes. <br> ● Unprintable repeat data $n2$. <br> ● Codes from 192 – 223. |

Table 15

# DMP-2100 Buffer Operation

The DMP-2100's ability to temporarily store data is one of its main advantages over a typewriter. Codes sent to a typewriter (i.e., keys pressed) are transferred immediately to the paper.
Codes sent to a Printer are not printed immediately; they are stored in a separate section of memory in the Printer called the buffer. When the buffer fills, or certain codes are received (i.e., LF or CR), the buffer is emptied and all data is printed on the paper. What happens after the buffer data is printed depends on the circumstances. In some cases, printing continues on the same line; in others, the Print Head is moved to a different position relative to the paper.

In the DP Mode, commands for changing print fonts, Line Feed, etc., can be stored in the buffer to make affect when the data is dumped to paper.

Understanding how the buffer works is important for those who wish to gain full control of the DMP-2100.

**Hints and Tips on the DMP-2100 Buffer . . . .**

For DP, WP, and Graphics Modes
● The buffer allocates a fixed number of dots depending on the character width selected. The buffer is emptied when the data stored equals that number.
Printing resumes at the start of the next line.

● The last character received by the buffer is printed at the start of the next print line following an automatic Line Feed and Carriage Return.

● The Form Feed code (FF = 12 decimal) automatically activates printing (if the code makes it to the Printer).
If LF only has been selected (Switch # 5), then the buffer is printed and the print head moves to the next Top-of-Form line without a carriage return to the start of the line.
Otherwise, the printing position is set at the start of the next Top-of-Form line.

● The Carriage Return code (CR = 13 decimal) automatically activates printing (assuming at least one character code is already in the buffer).
If Carriage Return only has been selected (Switch # 6), the printing position is moved to the start of the current line, but the next buffer full will print subsequent characters to the start of the next line regardless of the Switch # 6.
Otherwise, subsequent characters will be printed at the start of the next line.

● The Line Feed code (LF = 10) automatically activates printing.
If LF only has been selected (Switch # 5), then the buffer is printed and the Print Head moves to the next print line without a carriage return to the start of the line.
Otherwise, the printing position is set at the start of the next print line.

- If the computer delays more than 0.5 second before sending the next print code, the buffer is printed. Printing continues from the current position.

- The Dot Positioning sequence (27 16 n1 n2) prints the buffer, if the designated position is at the left from the current position. Printing continues in the current line at the dot address specified by the (27 16) command.

**Data and Word Processing Modes only:**

- The backspace command activates printing. Printing continues in the current line at the dot address specified by the command.

- If a character set of different dot density is selected, the data in the buffer is printed. Codes for changing character sets are: (27 17), (27 18), (27 19), (27 20), (27 23), and (27 29).
  Printing continues in the current line with the new character style.

- When the start Graphics Mode (18) is received followed by the Standard or Condensed characters, the buffer is printed.

- Dot graphics printing continues from the current character position.

- When a start Bold or end Bold is received, the buffer is printed.

- Bold printing continues from the current character position.

**Graphics Mode only:**

- When the end Graphics is received and returns to a Standard or Condensed character printing condition, the buffer is printed.
  The Printer returns to the previous print mode and printing continues in the same line from the current print position.

Note #1: In the description, "next line" means the new line performed by Line Feed operation. In Data Processing Mode, if a Reverse Line Feed has been set in the memory, the line feed operation will cause paper to move in the reverse direction.

Note #2: Repeat data can cause a buffer full or overflow condition, but the overflow characters are ignored and not printed at the start of the next line.

# 6/ Word and Data Processing Modes

## Superscript and Subscript

In an earlier section, we described that the difference between Data and Word Processing Mode is how they handle Line Feed codes. (In Data Processing Mode, LF codes are stored until the end of the line and become the current line feed standard; in Word Processing Mode, these codes are executed immediately and are only temprary.)

Printing superscripts and subscripts is the ideal time to take advantage of the immediate response to Line Feed codes in Word Processing Mode. Type in this new program:

```
10 E$ = CHR$(27)  'ESC
20 D$ = CHR$(28)  'DOWN
30 U$ = CHR$(30)  'UP
40 LPRINT CHR$(20)
100 LPRINT "(X";
110 LPRINT E$D$;"1";E$U$;"+X";
120 LPRINT E$D$;"2";E$U$;")";
130 LPRINT E$U$;"2";E$D$
```

and RUN the program.

In this program, frequently used codes are stored in variables E$, D$, and U$. This shortens the program a bit. The directions in line 10 through 30 refer to the motion you would make drawing the script characters by hand (move down to do the subscripts 1 and 2, the back up to the output line). Then move up to do the superscript 2.

## Repeat Printing

The DMP-2100 also provides a built-in repeat capability. You can use it to repeat a single character code up to 255 times. It's great for repeating graphic codes, underlining, repeated block graphics, etc. The Repeat feature uses a three code sequence:

● CHR$ (28)
● The number of repetitions.
● The code to be repeated.

Since we already have CHR$ (28) saved as D$ in the current program, lets try out the repeat sequence. Add or change:

```
50 LPRINT "  /";  :REM 2 BLANK SPACES BEFORE THE /
60 LPRINT E$U$;
70 LPRINT D$; CHR$(13); CHR$(241)
```

Code 241 is from the Graphic character set.

```
80 LPRINT " "; :REM 1 BLANK SPACE
90 LPRINT CHR$(8); CHR$(7)
100 LPRINT CHR$(92); "/(X";
```

and RUN it.

Line 60 contains a Reverse Half Line Feed to help line up the two slash (/) characters. Line 90 backspaces 7 dots. With a little fancy footwork you were able to line up the two slashes and came up with a rough approximation of a square root sign. Bringss back bad memories, doesn't it?

# Underline Printing

If you need to underline any text in either DP or WP Mode, send the DMP-2100 a CHR$ (15) . All text that follows this code will be underlined until you send a CHR$ (14) which stops underlining.

| Underline Printing | |
|---|---|
| Send a CHR$ (    ) : | To : |
| 15 | Start Underline |
| 14 | Stop Underline |

Table 16

For example, type in this short program:

```
10 LPRINT CHR$(20);:REM WORD PROCESSING
20 LPRINT CHR$(15);:REM START UNDERLINE
30 LPRINT "LEWAY BUSINESS PRODUCTS"
40 LPRINT CHR$(14);:REM STOP UNDERLINE
50 LPRINT "GIVES GOOD SERVICE"
```

In this example, line 20 turns on the underline and the first line of text (LEWAY BUSINESS PRODUCTS) is underlined. Line 40 turns the underline off and GIVES GOOD SERVICE is not underlined.

# Dot Positioning

In any Mode, you can position the Print Head to a specified dot position.

Every other Print Head position is accessible through the positioning sequence. The character stored in ROM can use the half step positions — you can't.

In other words, using the Correspondence-10 character sets (10 CPI), there are 4896 dot per line, but only half (2448) are accessible by you. The same is true for Proportional characters.

| DMP-2100 Dot Positioning | | |
|---|---|---|
| Character | Dot-per-Line | Available Columns |
| Standard-10 | 2448 | 2448 |
| Standard-12 | 2448 | 2448 |
| Cndensed-16.7 | 4080 | 4080 |
| Correspondence-10 | 4896 | 2448 |
| Correspondence-12 | 4896 | 2448 |
| Proportional | 4896 | 2448 |
| Graphics (regular) | 2448 | 816 |
| Graphics (High Res) | 2448 | 2448 |

Table 17

Elongation character use the same dot columns although the characters are printed twice as wide.

To position the Print Head to a specific position, send a (27 16), then two numbers (we'll call them *n*1 and *n*2) that specify the desired position. In other words, just follow this general procedure:

1. Send a Control Code which specifies the Character set (Standard, Condensed, Correspondence, Proportional or Graphics).

2. Send a CHR$ (27); CHR$ (16) to tell the Printer you want to position the Print Head to print at a specific dot-column.

3. Tell the Printer which dot-column you want to print.

   This is a little more complicated and will be explained shortly. For now, just understand that you simply tell the Printer which dot-column you want.

4. Tell the Printer what you want to print.

When you want to specify a dot-column for printing to begin, you must first use CHR$ to send the (27 16)code. Follow this with another two-code sequence which specifies the position. For instance:

```
LPRINT CHR$(27);CHR$(16);CHR$(n1);CHR$(n2)
```

where *n*1 is a value between 0 − 15 and *n*2 is a value between 0 − 255.

| Dot Positioning | | |
|---|---|---|
| If you wish to specify dot-column: | $n1$ must be: | $n2$ must be: |
| 0 – 255 | 0 | 0 – 255 |
| 256 – 511 | 1 | 0 – 255 |
| 512 – 767 | 2 | 0 – 255 |
| 768 – 1023 | 3 | 0 – 255 |
| 1024 – 1279 | 4 | 0 – 255 |
| 1280 – 1535 | 5 | 0 – 255 |
| 1536 – 1791 | 6 | 0 – 255 |
| 1792 – 2047 | 7 | 0 – 255 |
| 2048 – 2303 | 8 | 0 – 255 |
| 2304 – 2559 | 9 | 0 – 255 |
| 2560 – 2815 | 10 | 0 – 255 |
| 2816 – 3071 | 11 | 0 – 255 |
| 3072 – 3327 | 12 | 0 – 255 |
| 3328 – 3583 | 13 | 0 – 255 |
| 3584 – 3839 | 14 | 0 – 255 |
| 3840 – 4079 | 15 | 0 – 239 |

Table 18

**Remember!** Standard, Correspondence, Proportional, Graphic characters printing allows you to access dot-columns up to 2447 ($n1 = 9$, $n2 = 143$); Condensed printing allows you to access dot-columns up to 4079 ($n1 = 15$, $n = 239$); Graphics Mode printing allows you to access up to 815 ($n1 = 3$, $n2 = 47$).

Why two numbers ($n1$ and $n2$)? The maximum value you send to the DMP-2100 with one number is 255, and clearly you have to move more than 255 dot positions available.

Those of you who are fans of binary math will recognize that the DMP-2100 is interpreting these two number as a single 12-bit ($b(0) - b(11)$) value. The four lower bits of $n1$ are used as $b(8)$ through $b(11)$.

**Note:** Use 15" wide paper for this next example.

See if you can print a character string in position 2448 in Standard character. $n1 = 9$ gives 2304 of those dots, and $2448 - 2304 = 144$ is the difference to be sent as $n2$. Type:

```
10 LPRINT CHR$(27);CHR$(16);CHR$(9);CHR$(144);"*"
```

and RUN the program.

Whoops! The asterisk printed at the left edge of the paper.

Hmmm? Maybe you need to leave enough room for asterisk to fit on the line. Try:

```
10 LPRINT CHR$(27);CHR$(16);CHR$(9);CHR$(126);"*"
```

and RUN. That's better. It fits nicely at the end of the line Try this program with the different character densities.

Position is a little like a TAB, but it gets right down to the dot level, giving you much finer control. Although it is available in all three print modes, its potential is greatest in Graphics mode.

If you want to make a real mess on your paper, try:

```
10 LPRINT CHR$(27);CHR$(28);
20 FOR I=1 TO 100
30 LPRINT CHR$(27);CHR$(16);CHR$(1);CHR$(150+I*SIN(I/5));
40 LPRINT "*"
50 NEXT  I
```

and RUN the program.

But get out of double-width first!

# 7/ Graphics Mode

In Graphics Mode, you no longer have pre-defined characters at your disposal. You are responsible for the positioning and action of the Print Head.

The DMP-2100 prints two levels of graphics – a 7-bit, low-resolution graphics level and a high-resolution graphics level of printing.

The regular, low-resolution mode is the stndard Graphics Mode that other Radio Shack printers, such as the Line Printer VIII (26 – 1168), are capable of printing.

The high-resolution mode is a special Graphics Mode that is unique to the DMP-2100. It takes advantage of the Printer's 24-wire Print Head.

For instance, a Line Printer VIII's regular Graphics Mode creates a dot every time a wire in the Print Head strikes the ribbon. However, a Line Printer VIII's print wires are much larger than the print wires in a DMP-2100's Print Head. For the DMP-2100 to create a dot that is equal in size to a Line Printer VIII's dot, the print wires must strike the ribbon nine times.
This creates a 3 × 3 dot-matrix that is equal to the single dot on the Line Printer VIII.

To differentiate between regular and high-resolution dots, we'll call the image created by a single, DMP-2100 print wire striking the ribbon a "point". Nine points printed in a 3 × 3 matrix will create a "dot" which is the same size as the Line Printer VIII "dot".

How many "across the paper" addressable dot-columns are there?
The answer is 816.

How may "up and down" (dot-columns) addressable dots are there?
The answer is 7.

That means you can specify an one of up to 5712 individual dots (7 × 816 = 5712).

How do you print just one (or two or three) of those dots in the dot-column you want? (For example, how can you print the 3rd dot from the top in the 400th dot-column?)

Simple. Just follow this general procedure:

1. Send a CHR$(18) to put the DMP-2100 into Graphics Mode.

2. Send a CHR$(27); CHR$(16) to tell the Printer you want to position the Print Head to print a specific dot.

3. Tell the Printer which dot-column you want to print.
   This is a little more complicated and will be explained shortly. For now, just understand that you simply tell the Printer which dot-column you want.

4. Tell the Printer what you want to print. You can do this a number of ways. Again, this will be explained in more detail shortly. For now, just keep this overall procedure in mind.

When you want to specify a dot-column for printing to begin, you must first use CHR$ to send (27 16) code. Follow this with another two-code sequence which specifies the position. For instance:

```
LPRINT CHR$(27);CHR$(16);CHR$(n1);CHR$(n2)
```

where *n*1 is a value between 0 – 3 and *n*2 is a value between 0 – 255.

| Graphic Dot Positioning | | |
|---|---|---|
| If you wish to specify dot-column: | *n*1 must be: | *n*2 must be: |
| 0 – 255 | 0 | 0 – 255 |
| 256 – 511 | 1 | 0 – 255 |
| 512 – 767 | 2 | 0 – 255 |
| 768 – 815 | 3 | 0 – 47 |

Table 19

Remember! Graphics printing allows you to access dot-columns up to 815 (*n*1 = 3, *n*2 = 47).

Even though dot-columns greater than 255 exist, you cannot send values greater than 255. That is, CHR$ (400) is not allowed – you must break it into a two-byte value.

For instance, to draw a vertical bar at dot-column 144, try this program:

```
10 LPRINT CHR$(18)
20 LPRINT CHR$(27);CHR$(16);CHR$(0);CHR$(144);CHR$(255)
```

(Don't worry, that last CHR$ (255) will be discussed shortly.)

In line 10, CHR$ (18) puts the Printer into Graphics Mode and CHR$ (27) ; CHR$ (16) (line 20) tells it to get ready to position the Print Head.

Try this line to print a vertical bar at the right-most available dot-column – 815.

```
10 LPRINT CHR$(18);CHR$(27);CHR$(16);CHR$(3);CHR$(47);CHR$(255);
```

What happens is:

- CHR$ (18) puts the Printer into Graphics Mode.
- CHR$ (27) ; CHR$ (16) tells the DMP-2100 to get ready to position the Print Head.
- CHR$ (3) tells the Printer that the position will be greater than or equal to 768.
- CHR$ (47) specifies the last available dot-column.

(Note: If you used CHR$ (48) in this line instead of CHR$ (47), the DMP-2100 would ignore the positioning command and set the new position to the first dot-column in the same line.)

# Printing Graphics Patterns

By now, you should be adept at positioning the Print Head. But you also need to be able to tell the DMP-2100 what to be printed once the Head is positioned.

Remember that we said there were 7 vertical dots in a dot-column. You can print any or all of these dots in any combination you want.

Look back at the sample programs used when we talked about Print Head positioning. Do you remember the last part of the program line (CHR$ (255)) which always printed a vertical bar? That's an example of all 7 dots being printed at once.

Try printing just the top dot of that last dot-column (815):

```
10 LPRINT CHR$(18);CHR$(27);CHR$(16);CHR$(3);CHR$(47);CHR$(129);
```

How does the CHR$ (129) print just the top dot?

Even though the 7 dots in a dot-column are a vertical row, they are not numbered sequentially down from 1 to 7. Table 20 describes the numbering system you must use with the DMP-2100 when specifying an individual dot:

| DMP-2100 Addessable Dot Numbering System | | |
|---|---|---|
| Dot # : | Dot: | Number You Must Use To Print the Dot: |
| 1 | ● | 129 |
| 2 | ● | 130 |
| 4 | ● | 132 |
| 8 | ● | 136 |
| 16 | ● | 144 |
| 32 | ● | 160 |
| 64 | ● | 192 |

Table 20

For instance, you've already seen how to print the top dot in the column,but to print the bottom dot, change the progam line to:

```
10 LPRINT CHR$(18);CHR$(27);CHR$(16);CHR$(3);CHR$(47);CHR$(192);
```

This is fine if you want to print an individual dot, but how do you print a combination of dots?

It's actually quite simple too.

1. Specify the dot# (1-64, sec Table 20) that represent the individual dots you want to print.

2. Add those individual dot# 's together.

3. Add the sum of the combined dot# 's to 128.

For example, if you want to print the first dot (Dot# 1) the fourth dot (Dot# 8), and the last dot (Dot# 64), add them together: $1 + 8 + 64 = 73$. Then add the sum (73) to 128: $73 + 128 = 201$. Use 201 as the addressable dot pattern in the form CHR$ (201):

```
10 LPRINT CHR$(18);CHR$(27);CHR$(16);CHR$(3);CHR$(47);CHR$(201);
```

Remember how CHR$ (255) printed a solid (all dots printed) vertical bar. Try out the formula on that:

$(1 + 2 + 4 + 8 + 16 + 32 + 64) = 127 + 128 = 255$

The following sample program line will print a box with a line through the middle:

```
10 LPRINT CHR$(18);CHR$(27);CHR$(16);CHR(1);CHR$(30);
CHR$(255);CHR$(201);CHR$(201);CHR$(201);CHR$(201);CHR$(255);
```

Now to flex our muscles.

Type in this NEW program:

```
10 LPRINT CHR$(18)
20 S=1:N=128
30 FOR I=1 TO 20:S=-S
40 FOR J=0 TO 6
80 IF S<0 THEN N=N+2^(6-J) ELSE N=N-2^J
90 LPRINT CHR$(N);
100 NEXT J:NEXT I
120 LPRINT CHR$(30)
```

and RUN. Be prepared for a pause; it takes time to fill the print buffer.

This program alternately adds and subtracts powers of two to the current code pattern stored in the variable N. The net effect is to add or remove a single dot from the preceding dot pattern.

## Line Feed

In Graphics Mode, it is assumed that you want to print rows of graphics one right after another, each 7 dots high. Therefore, Graphics Mode provides only one line feed. A single line feed advances the paper 7 dots or approximately 0.12 inch. This small paper advance allows for continuous printing without unwanted space between lines.

Modify the current program to demonstrate this fixed line feed.
Add or change:

```
20 FOR K=1 TO 2:S=1:N=128
50 IF K=1 THEN 80
60 IF S<0 THEN N=N+2^J ELSE N=N-2^(6-J)
70 GOTO 90
110 LPRINT:NEXT K
```

and RUN.

These lines infiltrate the current loop and produce a mirror image of the first pass of the Print Head. The LPRINT in line 110 causes the Line Feed between passes.

## Repeat Function

CHR$ (28) will tell DMP-2100 to repeat a graphic pattern a specified number of times.

The format for the Repeat Function is:

*repeat code + number of times to repeat + what to repeat*

For instance, LPRINT CHR$(28);CHR$(15);CHR$(255) will print the solid vertical bar 15 times.

Change line 90 to:

```
90 LPRINT CHR$(28);CHR$(2);CHR$(N);
```

and RUN.

Or run this program:

```
10 LPRINT CHR$(18);
20 LPRINT CHR$(28);CHR$(50);CHR$(135);
```

## Print Density

Horizontal dot density in Graphics Mode is 1/60 inch fixed independent with the character width prior to entering Graphics Mode. Add to the current sample program:

```
5 LPRINT CHR$(27);CHR$(20);"CONDENSED CHARACTER WIDTH";
```

and RUN.

Line 5 activates the Condensed character set. Graphics are still printed in same density independently with the condensed character density.

## Leaving Graphics Mode

CHR$ (30) is used to exit Graphics Mode. It places the DMP-2100 in the same mode (DP or WP) the Printer was when it entered Graphics Mode. In addition, all the previous conditions, such as underline and character style, are restored. Change the sample program to :

```
90 LPRINT CHR$(N);
130 LPRINT "STILL IN CONDENSED MODE"
```

and RUN

Sure enough, the Condensed Mode is still alive and well.

## Mixing Modes on the Same Line

When the DMP-2100 moves in and out of Graphics Mode, the dot density is changed, if the font style is Standard or Condensed.

## Free Hand Drawings

Having graphics at your disposal is great, but you must realize that it requires plenty of data. The Computer can do most of the work in drawing figures that can be described by a mathematical function. Free hand drawing, on the other hand, require translating the figure into a matrix of dots, then calculating the dot printing combinations for each Print Head position.
Since there are 7 dots available for graphics, separate the matrix into rows 7 dots high.

The numbers can be stored in DATA statements. To conserve memory and typing time, store the data as numbers from 0 to 127, then add 128 as you send them to the Printer. Enter these sample DATA lines:

```
NEW ENTER
120 DATA 999
160 DATA 4,102,3,115,1,127,999
190 DATA 14,31,15,70,64,32,39,16,19,8,15,999
210 DATA 16,16,8,8,4,4,2,2,1,1,999
```

The 999's will be used to signify the end of line. The other number are between 0 and 127. Now for the program to read the numbers, add 128, then send them to the Printer:

```
10 LPRINT CHR$(18)
20 FOR R=1 TO 4
30 READ N:IF N=999 THEN 80
40 LPRINT CHR$(128+N);:GOTO 30
80 LPRINT :NEXT R
90 LPRINT CHR$(30)
100 LPRINT "DMP-2100"
```

and RUN.

Not much to brag about yet. Maybe what it needs is to be jazzed up to repeat a number several times. A good approach is to use negative numbers to indicate the number of repetitions followed by the number to be repeated. Add:

```
120 DATA 34,-4,66,68,-4,4,-5,8,-5,16,-5,32,-8,64,999
130 DATA 64,96,80,72,68,66,33,16,24,28,30,31,31,-5,62
180 DATA -3,35,39,39,71,103,87,79,71,67,33,16,8,4,2,1,0,0
```

Don't RUN yet!

In line 120, the sequence −4, 66 is used to mean four 66s:
66, 66, 66, 66. You must modify the program to recognize the negative numbers. Change:

```
40 IF N>=0 THEN LPRINT CHR$(128+N);:GOTO 30
50 READ M
60 LPRINT CHR$(28);CHR$(-N);CHR$(128+M);
70 GOTO 30
```

and RUN.

The figure still dosen't look like much. Add the remaining DATA lines and see what you've been working on.

```
110 DATA -7,0,64,64,96,96,16,16,72,72,36,36,18,18,17,-4,33
140 DATA -5,124,-5,120,-2,112,-2,113,-3,97,-3,98,66,66,68
150 DATA 100,68,-2,100,84,8,72,32,32,16,16,8,8
170 DATA 63,32,32,64,64,-5,1,-5,2,-5,4,8,8,-3,9,-3,17,19,19
200 DATA -5,0,-5,1,-5,2,-5,4,-5,8,-5,16,-5,39,64,127,32
```

and RUN.

Now that's worth the effort!

# High Resolution Graphics

High Resolution Graphics code sequence provides you to control over all of the available graphic dots. These are not "Dots" but "Points" actually correspond with Head Pins.

How many "across the paper" addressable point-columns are there?
The answer is 2448.

How many "up and down" (point-columns) addressable points are there? The answer is 24.

That means you can specify any one of up to 58752 individual points ($24 \times 2448 = 58752$).

The code sequence is as follows:

1.  CHR\$ (27); CHR\$ (73) tells the DMP-2100 that the High Resolution Graphics sequence is started.

2.  CHR\$ ($n1$); CHR\$ ($n2$) specify the point-column length across the paper. $n1$, $n2$ are defined by the same manner of Point Positioning code sequence (see Table 18), and the maximum value is 2448.

3.  CHR\$ ($d1$); CHR\$ ($d2$); CHR\$ ($d3$);.... are the image data and the amount of data must be a point-column length multiplied by 3.

For instance, to draw a diagonal line, try this program:

```
10 LPRINT CHR$(27);CHR$(73);CHR$(0);CHR$(24);
30 FOR I=1 TO 24
40 IF I<9 THEN D1=^(8-I) ELSE D1=0
50 IF I<17 AND I>8 THEN D2=2^(16-I) ELSE D2=0
60 IF I>16 THEN D3=2^(24-I) ELSE D3=0
70 LPRINT CHR$(D1);CHR$(D2);CHR$(D3);
90 NEXT I
100 LPRINT
```

How do you specify the individual point?

The point numbering system is different from that of low-resolution Graphics Mode. In High Resolution Graphics, the 24 points in each column are specified by the three bytes (8 bits × 3) data and higher 8 points are specified by the 1st byte, middle 8 are 2nd, lower 8 are 3rd.

Table 22 shows the point numbering system.

| DMP-2100 Addressable Point Numbering System | | | | |
|---|---|---|---|---|
| Physical Point # : | Logical Point # : | Number You Must Use to Print the Point: | | |
| | | Higher-8 | Middle-8 | Lower-8 |
| 1 | H-128 | 128 | 0 | 0 |
| 2 | H-64 | 64 | 0 | 0 |
| 3 | H-32 | 32 | 0 | 0 |
| 4 | H-16 | 16 | 0 | 0 |
| 5 | H-8 | 8 | 0 | 0 |
| 6 | H-4 | 4 | 0 | 0 |
| 7 | H-2 | 2 | 0 | 0 |
| 8 | H-1 | 1 | 0 | 0 |
| 9 | M-128 | 0 | 128 | 0 |
| 10 | M-64 | 0 | 64 | 0 |
| 11 | M-32 | 0 | 32 | 0 |
| 12 | M-16 | 0 | 16 | 0 |
| 13 | M-8 | 0 | 8 | 0 |
| 14 | M-4 | 0 | 4 | 0 |
| 15 | M-2 | 0 | 2 | 0 |
| 16 | M-1 | 0 | 1 | 0 |
| 17 | L-128 | 0 | 0 | 128 |
| 18 | L-64 | 0 | 0 | 64 |
| 19 | L-32 | 0 | 0 | 32 |
| 20 | L-16 | 0 | 0 | 16 |
| 21 | L-8 | 0 | 0 | 8 |
| 22 | L-4 | 0 | 0 | 4 |
| 23 | L-2 | 0 | 0 | 2 |
| 24 | L-1 | 0 | 0 | 1 |

Table 21

To clarify the point numbering system, add 2 lines:

```
20 PRINT "POINT"," H"," M"," L"
80 PRINT I,D1,D2,D3
```

and RUN.

Now, you may know how to specify the individual point in a column, but how do you print a combination of points?

This is already easy for you by using the same manner that of low-resolution Graphics Mode.

1.  Specify the Logical Point# (H, M, L    0 – 128) of each byte.

2.  Add those individual Point# 's together in each byte.

For example, if you want to print the 1st, 6th, 11th, 16th, 18th and 20th point, add them in each byte:

H-128 + H-4 → H-132
M-32 + M-1 → M-33
L-64 + L-16 → L-80

Use CHR$ (132) for Higher 8 points, CHR$ (33) for Middle 8 points and CHR$ (80) for Lower 8 points.

**Important Note:** In High Resolution Graphics sequence, you cannot put any control codes. Any data within the point-column length $((n1 \times 256 + n2) \times 3$ bytes) follow the CHR$ (27) ; CHR$ (73) ; CHR$ ($n1$) ; CHR$ ($n2$) are treated as the point image data.


## Line Feed

In High Resolution Graphics, it is assumed that you want to print row of graphics on right after another, each 24 points high. The 2/15″ line feed code (CHR$ (27) ; CHR$ (71)) allows for continuous printing without unwanted space between lines.

The 1/120″ line feed code (CHR$ (27) ; CHR$ (49) ) can be used if you want a micro line space. Two of this code (1/60″) corresponds to 3 points high.

These two line feed codes cause a immediate line feed regardless of the print mode, since the High Resolution Graphics can be used in any print mode.

# Appendix A/ Control Code Summary

| Code Dec. | Data Processing Mode | Word Processing Mode | Graphics Mode | Remarks |
|---|---|---|---|---|
| 00 01 | Ignored | Ignored | Ignored | |
| 08, n | Backspace (n = Binary) n : Backspaced Point number | Backspace (n = Binary) n : Backspaced Point number | Ignored Receives n as character data | *** |
| 10 | Executive Line Feed (Execute LF in accordance with information latched) | Full Line Feed (Executive) | 7/60" Line Feed (Executive) ..... | * LF/NL selectable |
| 12 | Form Feed | Form Feed | Form Feed | LF/NL selectable |
| 13 | Carriage Return (When NL, LF pitch is latched one.) | Carriage Return (When NL, LF pitch is 1/6" per line.) | Carriage Return (When NL, LF pitch is 7/60" per line.) | NL/CR selectable |
| 14 | End Underline | End Underline | Ignored | |
| 15 | Start Underline | Start Underline | Ignored | |
| 18 | Select Graphics Mode | Select Graphics Mode | Ignored | |
| 19 | Ignored | Select Data Processing Mode | Ignored | |
| 20 | Selected Word Processing Mode | Ignored | Ignored | |
| 27 01 ~ 09 | Proportional Spacing (2nd Byte is point column number.) | Proportional Spacing (2nd Byte is point column number.) | Ignored | *** |
| 27 10 | Set Full Reverse Line Feed (No motion) | Full Reverse Line Feed (Executive) | Ignored | *** |
| 27 14 | Start Elongation | Start Elongation | Start Elongation | |
| 27 15 | End Elongation | End Elongation | End Elongation | |
| 27, 16 n1, n2 | Positioning (2 pitches are available.) (n1, n2 indicate point position from left margin position) | Positioning (2 pitches are available.) (n1, n2 indicate point position from left margin position) | Positioning (2 pitches are available.) (n1, n2 indicate point position from left margin position) | n1, n2 : Binary value *** |
| 27 17 | Select Proportional character | Select Proportional charactor | Ignored | |

| Code Dec. | Data Processing Mode | Word Processing Mode | Graphics Mode | Remarks |
|---|---|---|---|---|
| 27 18 | Select Correspondence-10 character | Select Correspondence-10 character | Ignored | |
| 27 19 | Select Standard-10 character | Select Standard-10 character | Ignored | |
| 27 20 | Select Condensed character | Select Condensed character | Ignored | |
| 27 23 | Select Standard-12 character | Select Standard-12 character | Ignored | |
| 27 28 | Set Half Forward Line Feed (No motion) | Half Forward Line Feed (Executive) | Ignored | |
| 27 29 | Select Correspondence-12 character | Select Correspondence-12 character | Ignored | |
| 27 30 | Set Half Reverse Line Feed (No motion) | Half Reverse Line Feed (Executive) | Ignored | |
| 27 31 | Start Bold | Start Bold | Ignored | |
| 27 32 | End Bold | End Bold | Ignored | |
| 27 49 | 1/20 (1/120″) Forward Line Feed (Executive) | 1/20 (1/120″) Forward Line Feed (Executive) | 1/20 (1/120″) Forward Line Feed (Executive) | |
| 27 52, $n$ | Form Feed set | Form Feed set | Form Feed set | |
| 27 54 | Set Full Forward Line Feed (No motion) | Ignored | Ignored | |
| 27 56 | Set 3/4 Forward Line Feed (No motion) | 3/4 Forward Line Feed (Executive) | Ignored | |
| 27 71 | 4/5 (2/15″) Forward Line Feed (Executive) | 4/5 (2/15″) Forward Line Feed (Executive) | 4/5 (2/15″) Forward Line Feed (Executive) | |
| 27, 73 $n1$, $n2$ $d1$, $d2$, $d3$ | High Resolution Graphics ($n1$, $n2$ indicate point column length) ($d1$, $d2$, $d3$, ... are Image data) | High Resolution Graphics ($n1$, $n2$ indicate point column length) ($d1$, $d2$, $d3$, ... are Image data) | High Resolution Graphics ($n1$, $n2$ indicate point column length) ($d1$, $d2$, $d3$, ... are Image data) | |
| 27 75 | Insert New Paper | Insert New Paper | Insert New Paper | |

| Code Dec. | Data Processing Mode | Word Processing Mode | Graphics Mode | Remarks |
|---|---|---|---|---|
| 27<br>76 | Insert New Paper | Insert New Paper | Insert New Paper | |
| 28<br>*n1, n2* | Repeat Print Data (Undefined Code is changed to "X̄") | Repeat Print Data (Undefined Code is changed to "X̄") | Repeat Print Data (If MSB = 0, Data is ignored.) | |
| 30 | Ignored | Ignored | End Graphics Mode | |
| 127 | Ignored | Ignored | Ignored | |
| 255 | Ignored | Ignored | (Printing Data) | |
| Other Codes in Function Area (02 to 1F hex) | Prints "X̄" marks | Prints "X̄" marks | Ignored | |
| Other Codes in Function Area (80 to 9F hex) | Prints "X̄" marks | Prints "X̄" marks | (Printing Data) | |

**Note:** **\*** If Function Selection Switch 6 is set to OFF side, one line feed operation is performed at the same time

**\*\*\*** These codes may not be able to send to the printer by your computer. In this case, use system command to send them.

# Appendix B/ Character Sets

The DMP-2100 has 420 dot matrix patterns in the ROM (Read Only Memory). The following is a table of the character codes.

The printable characters may be classified as follows
- Proportional or Proportional Elongated
- Correspondence Correspondence Elongated

ASCII + Modified ASCII...................................... 94 + 4

European Symbol ................................................ 32

- Condensed or Condensed Elongated
- Standard or Standard Elongated

ASCII + Modified ASCII...................................... 94 + 4

European Symbol ................................................ 32

- Block Graphic ................................................................................................ 30

94 (+4) ASCII Code

## ASCII Character Sets

| Code | | | Char. | Code | | | Char. | Code | | | Char. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec. | Hex | Oct. | | Dec. | Hex | Oct. | | Dec. | Hex | Oct. | |
| 32 | 20 | 40 | (Space) | 64 | 40 | 100 | @ | 96 | 60 | 140 | ` |
| 33 | 21 | 41 | ! | 65 | 41 | 101 | A | 97 | 61 | 141 | a |
| 34 | 22 | 42 | " | 66 | 42 | 102 | B | 98 | 62 | 142 | b |
| 35 | 23 | 43 | # | 67 | 43 | 103 | C | 99 | 63 | 143 | c |
| 36 | 24 | 44 | $ | 68 | 44 | 104 | D | 100 | 64 | 144 | d |
| 37 | 25 | 45 | % | 69 | 45 | 105 | E | 101 | 65 | 145 | e |
| 38 | 26 | 46 | & | 70 | 46 | 106 | F | 102 | 66 | 146 | f |
| 39 | 27 | 47 | ' | 71 | 47 | 107 | G | 103 | 67 | 147 | g |
| 40 | 28 | 50 | ( | 72 | 48 | 110 | H | 104 | 68 | 150 | h |
| 41 | 29 | 51 | ) | 73 | 49 | 111 | I | 105 | 69 | 151 | i |
| 42 | 2A | 52 | * | 74 | 4A | 112 | J | 106 | 6A | 152 | j |
| 43 | 2B | 53 | + | 75 | 4B | 113 | K | 107 | 6B | 153 | k |
| 44 | 2C | 54 | , | 76 | 4C | 114 | L | 108 | 6C | 154 | l |
| 45 | 2D | 55 | - | 77 | 4D | 115 | M | 109 | 6D | 155 | m |
| 46 | 2E | 56 | . | 78 | 4E | 116 | N | 110 | 6E | 156 | n |
| 47 | 2F | 57 | / | 79 | 4F | 117 | O | 111 | 6F | 157 | o |
| 48 | 30 | 60 | 0 | 80 | 50 | 120 | P | 112 | 70 | 160 | p |
| 49 | 31 | 61 | 1 | 81 | 51 | 121 | Q | 113 | 71 | 161 | q |
| 50 | 32 | 62 | 2 | 82 | 52 | 122 | R | 114 | 72 | 162 | r |
| 51 | 33 | 63 | 3 | 83 | 53 | 123 | S | 115 | 73 | 163 | s |
| 52 | 34 | 64 | 4 | 84 | 54 | 124 | T | 116 | 74 | 164 | t |
| 53 | 35 | 65 | 5 | 85 | 55 | 125 | U | 117 | 75 | 165 | u |
| 54 | 36 | 66 | 6 | 86 | 56 | 126 | V | 118 | 76 | 166 | v |
| 55 | 37 | 67 | 7 | 87 | 57 | 127 | W | 119 | 77 | 167 | w |
| 56 | 38 | 70 | 8 | 88 | 58 | 130 | X | 120 | 78 | 170 | x |
| 57 | 39 | 71 | 9 | 89 | 59 | 131 | Y | 121 | 79 | 171 | y |
| 58 | 3A | 72 | : | 90 | 5A | 132 | Z | 122 | 7A | 172 | z |
| 59 | 3B | 73 | ; | 91 | 5B | 133 | [ (↑) | 123 | 7B | 173 | { |
| 60 | 3C | 74 | < | 92 | 5C | 134 | \ (↓) | 124 | 7C | 174 | ¦ |
| 61 | 3D | 75 | = | 93 | 5D | 135 | ] (←) | 125 | 7D | 175 | } |
| 62 | 3E | 76 | > | 94 | 5E | 136 | ^ (→) | 126 | 7E | 176 | ~ |
| 63 | 3F | 77 | ? | 95 | 5F | 137 | _ | | | | |

**Note:** Codes 5B Hex (91 Dec) through 5E Hex (94 Dec) can be changed to the characters within parentheses by setting the Function Selection Switch 7 to CLOSE (opposite to OPEN).

## 32 European Symbol Code

| Code | | | Char. |
|------|------|------|------|
| Dec. | Hex | Oct. | |
| 160 | A0 | 240 | ´ |
| 161 | A1 | 241 | à |
| 162 | A2 | 242 | ç |
| 163 | A3 | 243 | £ |
| 164 | A4 | 244 | ` |
| 165 | A5 | 245 | $\mu$ |
| 166 | A6 | 246 | ° |
| 167 | A7 | 247 | ▼ |
| 168 | A8 | 250 | † |
| 169 | A9 | 251 | § |
| 170 | AA | 252 | ® |
| 171 | AB | 253 | © |
| 172 | AC | 254 | 1/4 |
| 173 | AD | 255 | 3/4 |
| 174 | AE | 256 | 1/2 |
| 175 | AF | 257 | ¶ |
| 176 | B0 | 260 | ¥ |
| 177 | B1 | 261 | Ä |
| 178 | B2 | 262 | Ö |
| 179 | B3 | 263 | Ü |
| 180 | B4 | 264 | Ç |
| 181 | B5 | 265 | ~ |
| 182 | B6 | 266 | ä |
| 183 | B7 | 267 | ö |
| 184 | B8 | 270 | ü |
| 185 | B9 | 271 | ß |
| 186 | BA | 272 | TM |
| 187 | BB | 273 | é |
| 188 | BC | 274 | ù |
| 189 | BD | 275 | è |
| 190 | BE | 276 | ¨ |
| 191 | BF | 277 | $f$ |

**Note:** The "optimizer function" allows the following: If a spacing code (fixed space and/or proportional space) is received, the carriage moves only the shortest distance, and the action will take place without unnecessary movement. This saves printing time. When the character data (SP, proportional space or printable code) are sent to the Printer within a 0.5 sec. interval, the Printer automatically stores them until: (1) Function codes are sent (2) when the interval is greater than 0.5 sec. The printing is then executed.

## 30 Block Graphic Code

| Code | | | Char. | Code | | | Char. |
|---|---|---|---|---|---|---|---|
| Dec. | Hex | Oct. | | Dec. | Hex | Oct. | |
| 224 | E0 | 340 | (Blank) | 240 | F0 | 360 | ⌐ |
| 225 | E1 | 341 | ▪ | 241 | F1 | 361 | — |
| 226 | E2 | 342 | ▪ | 242 | F2 | 362 | ┐ |
| 227 | E3 | 343 | ▪ | 243 | F3 | 363 | ┬ |
| 228 | E4 | 344 | ▪ | 244 | F4 | 364 | ├ |
| 229 | E5 | 345 | ▪ | 245 | F5 | 365 | │ |
| 230 | E6 | 346 | ▪ | 246 | F6 | 366 | └ |
| 231 | E7 | 347 | ▬ | 247 | F7 | 367 | ┘ |
| 232 | E8 | 350 | ▬ | 248 | F8 | 370 | ┴ |
| 233 | E9 | 351 | ▌ | 249 | F9 | 371 | ┤ |
| 234 | EA | 352 | ▌ | 250 | FA | 372 | + |
| 235 | EB | 353 | ▛ | 251 | FB | 373 | ◤ |
| 236 | EC | 354 | ▜ | 252 | FC | 374 | ◢ |
| 237 | ED | 355 | ▙ | 253 | FD | 375 | ◣ |
| 238 | EE | 356 | ▟ | 254 | FE | 376 | ◤ |
| 239 | EF | 357 | ■ | | | | |

These characters are composed of 18 × 16 dot matrix. When using these codes to prepare diagrams, Line Feed should be set to "half line in forward". If other paper feed pitch is used, the diagram will not be accurate.

Proportional Character Set

Proportional characters are selected by using ESC DC1 control code sequence. The characters are composed by n × 24 dot matrix. These widths (n) vary from 8 dot columns to 23 dot columns.

Proportional Character Code table

| Dec | Hex | Char | Width | Dec | Hex | Char | Width | Dec | Hex | Char | Width |
|-----|-----|------|-------|-----|-----|------|-------|-----|-----|------|-------|
| 32 | 20 |  | 14 | 75 | 4B | K | 18 | 118 | 76 | v | 14 |
| 33 | 21 | ! | 8 | 76 | 4C | L | 16 | 119 | 77 | w | 19 |
| 34 | 22 | " | 11 | 77 | 4D | M | 23 | 120 | 78 | x | 14 |
| 35 | 23 | # | 14 | 78 | 4E | N | 18 | 121 | 79 | y | 14 |
| 36 | 24 | $ | 16 | 79 | 4F | O | 18 | 122 | 7A | z | 11 |
| 37 | 25 | % | 19 | 80 | 50 | P | 16 | 123 | 7B | { | 8 |
| 38 | 26 | & | 19 | 81 | 51 | Q | 18 | 124 | 7C | \| | 8 |
| 39 | 27 | ' | 8 | 82 | 52 | R | 18 | 125 | 7D | } | 8 |
| 40 | 28 | ( | 8 | 83 | 53 | S | 16 | 126 | 7E | ~ | 16 |
| 41 | 29 | ) | 8 | 84 | 54 | T | 18 | 160 | A0 | ´ | 14 |
| 42 | 2A | * | 13 | 85 | 55 | U | 18 | 161 | A1 | à | 14 |
| 43 | 2B | + | 14 | 86 | 56 | V | 18 | 162 | A2 | ç | 14 |
| 44 | 2C | , | 8 | 87 | 57 | W | 23 | 163 | A3 | £ | 16 |
| 45 | 2D | - | 8 | 88 | 58 | X | 18 | 164 | A4 | ` | 14 |
| 46 | 2E | . | 8 | 89 | 59 | Y | 18 | 165 | A5 | μ | 14 |
| 47 | 2F | / | 14 | 90 | 5A | Z | 16 | 166 | A6 | ° | 11 |
| 48 | 30 | 0 | 14 | 91 | 5B | [ | 8 | 167 | A7 | ▼ | 8 |
| 49 | 31 | 1 | 14 | 92 | 5C | \ | 14 | 168 | A8 | † | 14 |
| 50 | 32 | 2 | 14 | 93 | 5D | ] | 8 | 169 | A9 | § | 14 |
| 51 | 33 | 3 | 14 | 94 | 5E | ^ | 14 | 170 | AA | ® | 14 |
| 52 | 34 | 4 | 14 | 95 | 5F | _ | 16 | 171 | AB | © | 14 |
| 53 | 35 | 5 | 14 | 96 | 60 | ` | 8 | 172 | AC | 1/4 | 16 |
| 54 | 36 | 6 | 14 | 97 | 61 | a | 14 | 173 | AD | 3/4 | 16 |
| 55 | 37 | 7 | 14 | 98 | 62 | b | 14 | 174 | AE | 1/2 | 16 |
| 56 | 38 | 8 | 14 | 99 | 63 | c | 14 | 175 | AF | ¶ | 16 |
| 57 | 39 | 9 | 14 | 100 | 64 | d | 14 | 176 | B0 | ¥ | 18 |
| 58 | 3A | : | 8 | 101 | 65 | e | 14 | 177 | B1 | Ä | 18 |
| 59 | 3B | ; | 8 | 102 | 66 | f | 11 | 178 | B2 | Ö | 18 |
| 60 | 3C | < | 14 | 103 | 67 | g | 14 | 179 | B3 | Ü | 18 |
| 61 | 3D | = | 16 | 104 | 68 | h | 14 | 180 | B4 | ¢ | 14 |
| 62 | 3E | > | 14 | 105 | 69 | i | 8 | 181 | B5 | ˜ | 16 |
| 63 | 3F | ? | 14 | 106 | 6A | j | 8 | 182 | B6 | ä | 14 |
| 64 | 40 | @ | 19 | 107 | 6B | k | 14 | 183 | B7 | ö | 14 |
| 65 | 41 | A | 18 | 108 | 6C | l | 8 | 184 | B8 | ü | 14 |
| 66 | 42 | B | 18 | 109 | 6D | m | 19 | 185 | B9 | ß | 16 |
| 67 | 43 | C | 18 | 110 | 6E | n | 14 | 186 | BA | ™ | 18 |
| 68 | 44 | D | 18 | 111 | 6F | o | 14 | 187 | BB | é | 14 |
| 69 | 45 | E | 18 | 112 | 70 | p | 14 | 188 | BC | ù | 14 |
| 70 | 46 | F | 16 | 113 | 71 | q | 14 | 189 | BD | è | 14 |
| 71 | 47 | G | 18 | 114 | 72 | r | 11 | 190 | BE | ¨ | 14 |
| 72 | 48 | H | 18 | 115 | 73 | s | 12 | 191 | BF | f | 16 |
| 73 | 49 | I | 11 | 116 | 74 | t | 11 |  |  |  |  |
| 74 | 4A | J | 14 | 117 | 75 | u | 14 |  |  |  |  |

**Note:** The number on width-column indicates a dot size (1/180″) of each character.

Proportional Character Sets Dots Per Column (1/180 inch)

## 8 Dots

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ! | .......... 33/21 | : | .......... 58/3A | l | .......... 108/6C |
| ' | .......... 39/27 | ; | .......... 59/3B | { | .......... 123/7B |
| ( | .......... 40/28 | [ | .......... 91/5B | ¦ | .......... 124/7C |
| ) | .......... 41/29 | ] | .......... 93/5D | } | .......... 125/7D |
| , | .......... 44/2C | ` | .......... 96/60 | ▼ | .......... 167/A7 |
| – | .......... 45/2D | i | .......... 105/69 | | |
| . | .......... 46/2E | j | .......... 106/6A | | |

## 11 Dots

| | | | | | | |
|---|---|---|---|---|---|
| " | .......... 34/22 | r | .......... 114/72 | ° | .......... 166/A6 |
| I | .......... 73/49 | t | .......... 116/74 | ↑ | .......... 91/5B (TANDY) |
| f | .......... 102/66 | z | .......... 122/7A | ↓ | .......... 92/5C (TANDY) |

## 12 Dots

s    .......... 115/73

## 13 Dots

*    .......... 42/2A

## 14 Dots

| | | | | | | |
|---|---|---|---|---|---|
| Space | .......... 32/20 | \ | .......... 92/5C | ´ | .......... 160/A0 |
| # | .......... 35/23 | ^ | .......... 94/5E | à | .......... 161/A1 |
| + | .......... 43/2B | a | .......... 97/61 | ç | .......... 162/A2 |
| / | .......... 47/2F | b | .......... 98/62 | ` | .......... 164/A4 |
| 0 | .......... 48/30 | c | .......... 99/63 | μ | .......... 165/A5 |
| 1 | .......... 49/31 | d | .......... 100/64 | † | .......... 168/A8 |
| 2 | .......... 50/32 | e | .......... 101/65 | § | .......... 169/A9 |
| 3 | .......... 51/33 | g | .......... 103/67 | ® | .......... 170/AA |
| 4 | .......... 52/34 | h | .......... 104/68 | © | .......... 171/AB |
| 5 | .......... 53/35 | k | .......... 107/6B | ¢ | .......... 180/B4 |
| 6 | .......... 54/36 | n | .......... 110/6E | ä | .......... 182/B6 |
| 7 | .......... 55/37 | o | .......... 111/6F | ö | .......... 183/B7 |
| 8 | .......... 56/38 | p | .......... 112/70 | ü | .......... 184/B8 |
| 9 | .......... 57/39 | q | .......... 113/71 | é | .......... 187/BB |
| < | .......... 60/3C | u | .......... 117/75 | ù | .......... 188/BC |
| > | .......... 62/3E | v | .......... 118/76 | è | .......... 189/BD |
| ? | .......... 63/3F | x | .......... 120/78 | ¨ | .......... 190/BE |
| J | .......... 74/4A | y | .......... 121/79 | | |

Proportional Character Sets Dots Per Column (1/180 inch) (Continuous)

## 16 Dots

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $ | .......... 36/24 | Z | .......... 90/5A | 1/2 | .......... 174/AE |
| = | .......... 61/3D | _ | .......... 95/5F | ¶ | .......... 175/AF |
| F | .......... 70/46 | ~ | .......... 126/7E | ~ | .......... 181/B5 |
| L | .......... 76/4C | £ | .......... 163/A3 | ß | .......... 185/B9 |
| P | .......... 80/50 | 1/4 | .......... 172/AC | f | .......... 191/BF |
| S | .......... 83/53 | 3/4 | .......... 173/AD | | |

## 18 Dots

| | | | | | | |
|---|---|---|---|---|---|
| A | .......... 65/41 | N | .......... 78/4E | Y | .......... 89/59 |
| B | .......... 66/42 | O | .......... 79/4F | ¥ | .......... 176/B0 |
| C | .......... 67/43 | Q | .......... 81/51 | Ä | .......... 177/B1 |
| D | .......... 68/44 | R | .......... 82/52 | Ö | .......... 178/B2 |
| E | .......... 69/45 | T | .......... 84/54 | Ü | .......... 179/B3 |
| G | .......... 71/47 | U | .......... 85/55 | ™ | .......... 186/BA |
| H | .......... 72/48 | V | .......... 86/56 | ← | .......... 93/5D (TANDY) |
| K | .......... 75/4B | X | .......... 88/58 | → | .......... 94/5E (TANDY) |

## 19 Dots

| | | | | | |
|---|---|---|---|---|
| % | .......... 37/25 | @ | .......... 64/40 | w | .......... 119/77 |
| & | .......... 38/26 | m | .......... 109/6D | | |

## 23 Dots

| | |
|---|---|
| M | .......... 77/4D |
| W | .......... 87/57 |

# Appendix C/ Programming Information

The following items should be considered when you program the Computer

1. When Printer Power is turned on.

   ● Selects optional function set by Function Selection Switch.

   ● If Data Processing mode is selected, Full Forward Line Feed is set.

   ● Selects one of six character styles by Function Selection Switch position.

   ● Underline is not set.

   ● Sets normal character (not-Elongated and not-Bold)

   ● Buffer memory is completely cleared.

2. Every character font can be intermixed with another style of character in the same line.  However, the junction of Condensed character and the other characters the printer will insert point spaces to ensure that the new point position is valid for the current point pitch.  This may cause unexpected auto-wraparound.  To prevent this, intermix characters for Condensed and others only on short lines, or don't mix Condensed and others on the same line.

3. Since a micro spacing command may be used in any character set condition, right-justification can be performed.  You must consider that proportional spacing commands can indicate up to 9 point spacing while using Standard/Correspondence (10 or 5 CPI), (12 or 6 CPI);  Condensed (16.7 or 8.3 CPI);  or Proportional characters, therefore, a normal space 20 Hex (32 Dec) gives 18 points (10 or 16.7 CPI), 36 points (5 or 8.3 CPI), 15 points (12 CPI), 30 points (6 CPI) and 14 points (Proportional) spaces.

4. Elongated (Double-width) characters, Bold and Underline are not terminated at the end of the line and printing continues until a terminating command is received.

5. You should avoid wrap-around.  Wrap-around will disturb the point count of the text in a line.

6. Backspace is performed in the same manner under any character set condition.  This command indicates the number of points to backspace.

7. In the Repeat Data command, printable characters can be repeated as many times as provided for in the count number.
   If any function code is received for repetition, it will be considered an invalid symbol (X̄ mark).

8. POS command can be used at any carriage position. If designated point column address is in the current text which is already printed out, overprint will occur.

9. Under block graphic printing, Half Line Feed Forward should be used for printing of diagrams.

10. Line Feed in Graphics mode is different from Line Feed pitches in Data Processing or Word Processing mode. It will generate an odd vertical spacing in Graphics mode while the other modes intermix in a form. Consider the following relationship between Line Feed pitches.

    7 times of Full Line Feed = 10 times of Graphics Mode Line Feed

    7 times of Half Line Feed = 5 times of Graphics Mode Line Feed

11. Graphics printing can be intermixed with character printing in a same line. Dot density in Graphics Mode is fixed on original pitch (60 points per inch).

12. Bold character is useful for heading or title.

# Programming Examples

Note to Model II Programmers:

If the Printer goes off-line during a print operation, and remains off-line for a certain period of time, Model II TRSDOS will present an error message. Application programs should be written to trap such errors, inform the operator of the error condition, and give the operator a chance to correct the condition and continue printing. If it is a BASIC applications program, an I/O error will occur, and the operator may type CONT **ENTER** .

The BASIC statements LPRINT and LLIST output to the Line Printer. See Your Computer's Reference Manual for syntax details.

Examples:

```
LLIST
```
    Lists the resident program to the Printer
```
LPRINT "THIS IS A TEST"
```
    Prints the message in quotes and tells the Printer that the next printable character begins a new line.
```
LPRINT "THIS IS PART OF A LINE";:LPRINT "THIS IS THE REST"
```
    Prints both messages on the same line (because of the semicolon). The next printable character received starts a new line.
```
LPRINT "SMALL";CHR$(27);CHR$(14);"LARGE";CHR$(27);CHR$(15);
"SMALL AGAIN"
```
    Prints both normal and elongated characters on the same line.

```
LPRINT CHR$(27);CHR$(17);"PROPORTIONAL";CHR$(27);CHR$(18);
"CORRESPONDENCE";CHR$(27);CHR$(20);"CONDENSED";CHR$(27);CHR$(19);
"STANDARD"
```
    Prints proportional, correspondence, condensed, and standard characters in the same line.
```
LPRINT "X";CHR$(20);CHR$(27);CHR$(30);"2";CHR$(27);CHR$(28);"+X=Y"
```
    Prints an algebraical function expression $X^2 + X = Y$.
```
LPRINT "H";CHR$(27);CHR$(28);"2";CHR$(30);"O"
```
    Prints the chemical formula for water $H_2O$.
```
LPRINT CHR$(19);"START";CHR$(27);CHR$(56);:LPRINT "ONE LINE":LPRINT
"TWO LINES"
```
    Prints these letters at 3/4 line pitch.
```
LPRINT CHR$(15);"UNDERLINE";CHR$(14);"WITHOUT UNDERLINE"
```
    Prints messages underlined and non-underlined on the same line.

```
LPRINT CHR$(27);CHR$(31);"BOLD LETTERS";CHR$(27);CHR$(32);
"NORMAL LETTERS"
```

Prints Bold letters and normal letters on the same line.

```
LPRINT CHR$(28);CHR$(9);"ABC"
```

Prints 9 characters of "A"s and one character "BC"

```
LPRINT CHR$(13);CHR$(27);CHR$(16);CHR$(01);CHR$(44);"300TH POSITION"
```

Prints above message from 300th column address.

```
LPRINT CHR$(27);CHR$(17);"A";CHR$(27);CHR$(09);"B";CHR$(27);
CHR$(06);"C";CHR$(27);CHR$(03);"DE"
```

Prints ABCDE by using proportional spcing.

```
LPRINT CHR$(18);CHR$(255);CHR$(247);CHR$(227);CHR$(193);CHR$(227);
CHR$(247);CHR$(255);CHR$(30)
```

Prints a special symbol in Graphics mode.

```
LPRINT "DELETE";CHR$(08);CHR$(108);"//////"
```

Prints the message DELETE, then it is deleted by diagonal lines.

# Appendix D/ Care and Maintenance

1.  Always plug the Printer into a 3-wire grounded receptacle.

2.  Be sure that Upper Cover is closed and secured while in operation.

3.  Never operate Printer without paper. If paper used is less than 15″ wide, take care to see that printing does not exceed paper width.

4.  Avoid leaning objects again Printer or placing anything on top. If any objects is accidentally dropped into the machine, turn power off and carefully remove object.

5.  Be sure to turn power off when replacing ribbon.
    Note: When you turn power off, all data stored in Printer's buffer will be lost; keep this in mind as you perform maintenance. Remember that toggling the printer's power can also cause erratic operation of the CPU.

6.  Use only lint-free cloth to clean printer surface. Do not use solvents or harsh cleaning agents. Mild detergent solution or desk top cleanser may be used sparingly.

7.  Keep hands away from carriage mechanism while Printer is in operation. Since carriage moves with considerable force, inserting hand would be extremely hazardous.

8.  Printer must be kept dry. If water is accidentally spilled on machine, turn power OFF immediately and wipe dry. Do not turn power ON until completely dry.

9.  If printed material is too light or too dark, check to see if the Copy Control Lever is set according to the number of copies.

**Care**

- Do not use organic solvents or alcohol when cleaning the cover.

- Never operate Printer when Front Cover is opened.

- Never set the Print where it is exposed to direct sunlight.

- Prevent the Printer from vibrating during operation.

- Graphics printing places a heavier load on the print head than do text characters. If you print too many block graphic characters or regular or High Resolution Graphics without pausing, the print head could overheat, causing the fuse to blow.
  When you must print graphics continuously, be sure to pause the printing for at least one minute after each 1/6th paper is printed (assuming a 15″ × 11″ page). Avoid repeating this procedure over 5 times, though: if you need to printing continuously over pages, pause over 10 minutes each four take ones. This will prevent the unit from overheating. In terms of load on the print head, the underline falls into the graphics category, and should be treated as such.

**Maintenance**

● If the print Head become clogged with ribbon material or paper lint, carefully remove such material with a finely pointed tool (preferably a toothpick).  this should be regularly checked.

● A Print Head's life expectancy is approximately 950 hours (in other words, if you use the Printer two hours a day on the average, the Print Head should be changed every 24 months).  When poor print quality, sticking ribbon, or bent character printing occurs, you should have the Print Head replaced by a Radio Shack service technician.

● After cleaning with a soft cloth, lightly oil the two carriage guides with a high-grade ester lubrication oil or with high-grade sewing machine oil.  (This should be done at least every six months.)

● You can and should perform standard cleaning procedures, just as you would with any office typewriter.  Clean the platen, Bail Roller and other parts with standard typewriter cleaning fluids (use a soft, lint free cloth)

If you Have Problems...

If the Printer fails to operate properly, try to solve the trouble by using the following table.

| SYMPTOM | INSPECTION and ADJUSTMENT |
|---|---|
| Printer does not operate when POWER switch is turned ON. | ● Is power cord properly connected? |
| Printer stops before paper runs out. | ● Is power source voltage too low?  Printer should stop if below 85% of rated voltge.<br>If you cannot hear any sound or see any movement, disconnect power cord and check the fuse. |
| Printer stops with ALERT indicator lit. | ● Is carriage guide dirty?  If so, clean it using cloth and lubricate high-grade ester lubricating oil or high-grade sewing machine oil.<br><br>● Has some object dropped inside the Printer?<br><br>● If nothing is wrong, turn power OFF, then ON. |

| SYMPTOM | INSPECTION and ADJUSTMENT |
|---|---|
| Ribbon fails to track properly. | ● Is ribbon cassette properly set? |
| | ● Has ribbon come off from print head ribbon guide and is loose? |
| | ● Is ribbon so worn that it does not feed smoothly from cassette? |
| | ● Has the print head reached its life expectancy? Worn out head will stick to ribbon and interfere with smooth movement. Replace the print head with a new one. |
| Poor Print Quality or smudging on paper. | ● Is ribbon old and/or worn? |
| | ● Is Copy Control Lever set at proper position? |
| | ● Is tip of print head dirty? If dirty, clean off with a toothpick or needle. |
| Erratic operation or wrong character printing. | ● Is interface cable and/or connector damaged? |
| | ● Are interface connectors inserted properly to the Computer or to the Printer? |
| The paper cannot be advanced smoothly. | ● Is paper loaded properly into entrance of insertion opening? |
| | ● Is any obstacle preventing smoothly paper motion? |
| | ● Does paper stick or tear because of side guide pins? |

If the trouble cannot be corrected after making the above check-up and adjustment, check for secure contacts of all connectors. If you can't eliminate the problem, take the unit to your Radio Shack Store or Computer Center for repair.
We'll have it back to you ASAP!

# Appendix E/ Specifications

Printing Speed (CPS)

| | | | |
|---|---|---|---|
| Standard-10 | Normal | 10 CPI................ | 160 |
| | Elongated | 5 CPI................ | 80 |
| Standard-12 | Normal | 12 CPI................ | 192 |
| | Elongated | 6 CPI................ | 96 |
| Condensed-16.7 | Normal | 16.7 CPI................ | 160 |
| | Elongated | 8.3 CPI................ | 80 |
| Correspondence-10 | Normal | 10 CPI................ | 78 (1 or 2 parts) |
| | | | 53 (3 or 4 parts) |
| | Elongated | 5 CPI................ | 39 (1 or 2 parts) |
| | | | 26 (3 or 4 parts) |
| Correspondence-12 | Normal | 12 CPI................ | 93 (1 or 2 parts) |
| | | | 64 (3 or 4 parts) |
| | Elongated | 6 CPI................ | 46 (1 or 2 parts) |
| | | | 32 (3 or 4 parts) |
| Proportional | Normal | – ................ | 100 Avr. (1 or 2 parts) |
| | | | 68 Avr. (3 or 4 parts) |
| | Elongated | – ................ | 50 Avr. (1 or 2 parts) |
| | | | 34 Avr. (3 or 4 parts) |

Character Per Line

| | | | |
|---|---|---|---|
| Standard-10 | Normal | 10 CPI................ | 136 |
| | Elongated | 5 CPI................ | 68 |
| Standard-12 | Normal | 12 CPI................ | 163 |
| | Elongated | 6 CPI................ | 81 |
| Condensed-16.7 | Normal | 16.7 CPI................ | 226 |
| | Elongated | 8.3 CPI................ | 113 |
| Correspondence-10 | Normal | 10 CPI................ | 136 |
| | Elongated | 5 CPI................ | 68 |
| Correspondence-12 | Normal | 12 CPI................ | 163 |
| | Elongated | 6 CPI................ | 81 |
| Proportional | Normal | – ................ | 174 Avr. |
| | Elongated | – ................ | 87 Avr. |

Points Per Character

| | | | |
|---|---|---|---|
| Standard-10 | Normal | 10 CPI................ | 18 |
| | Elongated | 5 CPI................ | 36 |
| Standard-12 | Normal | 12 CPI................ | 15 |
| | Elongated | 6 CPI................ | 30 |
| Condensed-16.7 | Normal | 16.7 CPI................ | 18 |
| | Elongated | 8.3 CPI................ | 36 |
| Correspondence-10 | Normal | 10 CPI................ | 36 |
| | Elongated | 5 CPI................ | 72 |
| Correspondence-12 | Normal | 12 CPI................ | 30 |
| | Elongted | 6 CPI................ | 60 |
| Proportional | Normal | – ................ | 28 Avr. |
| | Elongated | – ................ | 56 Avr. |

Points Per Line

| | | | |
|---|---|---|---:|
| Standard-10 | Normal | 10 CPI. . . . . . . . . . . . . . . . . . | 2448 |
| | Elongated | 5 CPI. . . . . . . . . . . . . . . . . . | 2448 |
| Standard-12 | Normal | 12 CPI. . . . . . . . . . . . . . . . . . | 2448 |
| | Elongated | 6 CPI. . . . . . . . . . . . . . . . . . | 2448 |
| Condensed-16.6 | Normal | 16.7 CPI. . . . . . . . . . . . . . . . . . | 4080 |
| | Elongated | 8.3 CPI. . . . . . . . . . . . . . . . . . | 4080 |
| Correspondence-10 | Normal | 10 CPI. . . . . . . . . . . . . . . . . . | 4896 |
| | Elongated | 5 CPI. . . . . . . . . . . . . . . . . . | 4896 |
| Correspondence-12 | Normal | 12 CPI. . . . . . . . . . . . . . . . . . | 4896 |
| | Elongated | 6 CPI. . . . . . . . . . . . . . . . . . | 4896 |
| Proportional | Normal | − . . . . . . . . . . . . . . . . . . | 4896 |
| | Elongated | − . . . . . . . . . . . . . . . . . . | 4896 |
| Graphics Mode (Regular) | Normal | − . . . . . . . . . . . . . . . . . . | 816 |
| | Elongated | − . . . . . . . . . . . . . . . . . . | 408 |
| High Resolution Graphics | Normal | . . . . . . . . . . . . . . . . . . | 2448 |

| | | |
|---|---|---|
| Vertical Spacing | Forward | 1/6″ |
| | | 1/8″ |
| | | 1/12″ |
| | | 2/15″ |
| | | 7/60″ (Graphics Mode) |
| | | 1/120″ |
| | Reverse | 1/6″ |
| | | 1/12″ |

Character Set

| | |
|---|---|
| Standard and Condensed | ASCII 94 + European 32 + TANDY 4 |
| Correspondence | ASCII 94 + European 32 + TANDY 4 |
| Proportional | ASCII 94 + European 32 + TANDY 4 |
| Graphic Symbols | 30 |

Interface

| | |
|---|---|
| Parallel | 8-bit Data and 4-bit Status |

Print Head Life . . . . . . . . . . . . . . . . . . . . . . . . . . . . 200 million characters (in case of Standard-10 Characters printing)

Temperature and Humidity Range

Operating . . . . . . . . . . . . . . . . . . . . . . . . . . . . 41°F (5°C) to 104°F (40°C)
20% to 85% RH (non-condensing)

Storage . . . . . . . . . . . . . . . . . . . . . . . . . . . . −40°F (−40°C) to 160°F (71°C)
10% to 95% RH (non-condensing)

Paper

    Friction Feed
       Width             4″ to 15″
       Weight          1 part; 10 lbs (39.5 g/m²) to 22 lbs (81.4 g/m²)
                         Multi-parts; 10 lbs (39.5 g/m² Non-carbon paper)
       Copies         Up to 3 parts including original

    Tractor Feed (Option/extra) (26 – 1441)
       Width             4″ to 15″
       Weight          1 part; 14 lbs (52.3 g/m²) to 22 lbs (81.4 g/m²)
                         Multi-parts; 10 lbs (39.5 g/m² Non-carbon paper)
       Copies         Up to 4 parts including original

Ribbon .......................................................... Radio Shack Catalog Number 26 – 1442

Size ............................................................... 21.7″ × 15″ × 5.9″
                                                   550 mm × 380 mm × 150 mm

Weight .......................................................... 42 lbs (19 kg)

Power Requirement ....................................... 102V to 138V    60 Hz ± 1 Hz
                                                   198V to 264V    50 Hz ± 1 Hz

*Memo*

*Memo*

This equipment generates and uses radio frequency energy. If not installed and used properly, that is, in strict accordance with the manufacturer's instructions, it may cause interference to radio and television reception.

It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, you should consult the dealer or an experienced radio/television technician for additional suggestions. You may find the following booklet prepared by the Federal Communications Commission helpful: *How to Identify and Resolve Radio-TV Interference Problems*.

This booklet is available from the US Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

# Warning

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.